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PRACTICE WITH SCIENCE.

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JOHN MURRAY, ALBEMARLE STREET.

THESE EXPERIMENTS, IT IS TRUE, ARE NOT EASY; STILL THEY ARE IN THE POWER OF EVERY THINKING HUSBANDMAN. HE WHO ACCOMPLISHES BUT ONE, OF HOWEVER LIMITED APPLICATION, AND TAKES CARE TO REPORT IT FAITHFULLY, ADVANCES THE SCIENCE, AND, CONSEQUENTLY, THE PRACTICE OF AGRICULTURE, AND ACQUIRES THEREBY A RIGHT TO THE GRATITUDE OF HIS FELLOWS, AND OF THOSE WHO COME AFTER. TO MAKE MANY SUCH IS BEYOND THE POWER OF MOST INDIVIDUALS, AND CANNOT BE EXPECTED. THE FIRST CARE OF ALL SOCIETIES FORMED FOR THE IMPROVEMENT OF OUR SCIENCE SHOULD BE TO PREPARE THE FORMS OF SUCH EXPERIMENTS, AND TO DISTRIBUTE THE EXECUTION OF THESE AMONG THEIR MEMBERS

VON THAER, *Principles of Agriculture.*

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JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

I.—*Agriculture of Nottinghamshire.* By R. W. CORRINGTON.

PRIZE REPORT.

IN taking a survey of the agriculture of Nottinghamshire, the county will, from the different character of its soils, naturally divide itself into two principal districts; the one extending over the whole of the eastern and southern sides of the county, may be termed the south-eastern; the other may be distinguished simply as the western, as it narrows itself to an angle in the north. In these two divisions differences of soil occur which will be noticed as we proceed. Thus by drawing an imaginary line from Nottingham to East Retford the county is divided diagonally, leaving the former of these districts, viz. the south-eastern, which is composed of a variety of soils, but chiefly of those of a somewhat tenacious character, almost or altogether free from the sand or gravelly soil of which the western is in a great measure composed.

The principal geological formation in the county of Nottingham is the new red sandstone, which may be shortly described as consisting chiefly of clays, sandstones, and sandy conglomerates, of various colours, red, white, and green, in their various alternations. In Nottinghamshire this formation is, to a considerable extent, a conglomerate; there are found also various marls and gypsum.

On the western side of the county the magnesian limestone crops out, and its eastern boundary may be pretty clearly defined by a line commencing a few miles to the north-west of Nottingham, and passing through Mansfield and Cuckney, a little to the west of Worksop and Blyth, and through Tickhill. This formation runs northward, with a slight inclination to the west, as far as Ripon and Masham in Yorkshire.

A narrow belt of the lower new red sandstone accompanies this on the west, and divides it from the coal formations of Derbyshire.

With this general foundation, the top soils throughout the county will be found in every gradation from light sand to strong clay. The sand will be found to prevail on the western side of the county from Nottingham to East Retford, as has been before observed. The clays are prevalent in the districts, which have in consequence been called the north and south clay divisions of the Hundred of Bassetlaw, on the eastern side of the county; and also, south of the Trent on the borders of Leicestershire, in the districts of the vale of Belvoir and the Nottinghamshire Wolds, leaving an extensive tract of land between the two last-named districts on the one hand and the River Trent on the other; in the southern parts of the county a "mixture of both, or what constitutes a rich loam, which amply repays the toil and exertions of the agriculturist."

In the extreme north-east, a small district called the "Cars" presents some peculiarities which will be noticed when we come to speak of that district.

The Western or Sand District.

Mr. Lowe published his Report of the Agriculture of Nottinghamshire in the year 1794, exactly half a century ago; and perhaps it is not assuming too much to say that since that time no county or district in England has undergone a greater change for the better. Nearly the whole of this division was, at the time Mr. Lowe wrote, a vast tract of waste land, the remains of the ancient forest of Sherwood. And although it is now shorn of the beauty it once boasted, when described by Camden, as "anciently thick set with trees, whose entangled branches were so twisted together, that they hardly left room for a single person to pass;" and may be regarded as scarcely identical with its former self; still some chosen spots remain untouched by the hand of time, which may be seen by a visit to a tract known by the name of Birkland, forming part of the Earl Manvers's park at Thoresby. Many thanks are due from the lover of the picturesque to the noble owner and his ancestors, for the hand of care so long extended to those ancient oaks still existing in all their primeval beauty, interesting relics of bygone days.

Here, in imagination, the visitor may be transported back to the days of Robin Hood and Little John, whose exploits have rendered them famous in legend and romance; or picture to himself the inimitable scene in *Ivanhoe*, when the Rev. the Clerk of Copmanhurst, the confessor of those freebooters of jovial notoriety, exhibits in the first instance a grudging hospitality of parched peas and water to the chivalric Richard Cœur-de-Lion;

but afterwards regales him more liberally on venison, the furtive spoils of his own royal demesnes, washed down by a "stoup of canary." As however none of these heroes have been noticed in history as being in their day pre-eminently protective of the interests of agriculture, and lest we should lay ourselves open to the serious charge of playing truant to our subject, we will, with becoming sobriety, devote ourselves to the fulfilment of our proper task, by proceeding to show the gradual, and in all points of view, greatly beneficial, change which has been almost entirely brought about during the present century by means of an improved cultivation.

As the forest was cleared of its stately trees it was left one wide waste so naturally sterile, as scarcely to have the power of clothing itself with the scantiest vegetation: even in the present day some districts remain which bear testimony to its former sterility. The fern, the gorse, the heath, and the delicate lichen, divide amongst them the soil; but nature has been forced to yield to art, and a noble triumph it has been, as well as one of great importance to the community at large. She has been gradually encroached upon and narrowed in her boundaries, until only so much is left as may serve to show what she formerly was. Where in former times only the rabbit browsed, large flocks of sheep are now fed—nutritious pasturage in the summer and fine crops of turnips in the winter, furnishing to them an abundance of food, whilst these crops are succeeded every alternate year by cereal ones of the best quality.

The inclosures are divided by quickset hedges, and are for the most part large, though varying in that respect for the sake of convenience with the size of the farms, which are usually from 300 to 500 acres each: some few are, however, considerably larger, although not many exceed 1000 acres. The great proportion of the land which is annually sown with turnips, imparts to the country at all seasons, and especially so during the winter months, as compared with many counties, a pleasing aspect. The bright colours of their leaves, with the flocks of sheep spread over them, give to the gently undulated hills, as they succeed each other over all the western part of the county, a cheerful and highly domestic appearance; an appearance in short which is characteristic of England, and can be seen in no other country in Europe.

Unlike the eastern half of the county, which falls gradually from the range of hills as they run almost parallel to the River Trent, and afterwards shelves down into alluvial beds which form the banks of that river, leaving the country nearly level to the eye, on the western side the hills assume a more marked character,

attaining to a higher elevation, and are more rounded in their contour, yet seldom so high as to be seriously inconvenient to the farmer, at the same time never sinking into tameness of outline. The highest ranges, moreover, being planted, afford a valuable shelter to the corn as well as stock; and although they may harbour more of game and rabbits than the occupier might wish, still they are of unquestionable utility on the points to which we have alluded.

Neither is this extensive district, forming an area of fully one-third of the county, by this transformation at all denuded of that natural beauty with which some sanguine minds may have been pleased to invest it when regretting the change, which by them is regarded as merely utilitarian: on the contrary, one can hardly picture to the imagination a more delightful country than the western half of Nottinghamshire, with its rising forests of thriving larch and oak timber, upon which are bestowed as much care as if they were but shrubberies instead of vast plantations resembling forests.

And here it is only due to advert in a summary way to the material share which the present Duke of Portland has had in promoting these improvements. So prominent a part has his Grace taken for many years, in contributing not only to the beauty of the district in which his estates lie, by planting and otherwise adorning it, but also in taking a most decided lead in the march of agricultural progression; that the mention of the name of the Duke in this place, while it cannot appear invidious to others, will only be just to him.

Of the long line of water-meadows running for miles through the Duke's property, a description has already appeared in the Society's Journal in vol. i. for 1840, from the pen of Mr. Denison, so complete, as to require but a slight notice to be taken of it in this Essay. The superior and spirited manner in which the farming has for many years been conducted under the constant and even daily supervision of his Grace at Clipston, is known too far to allow any eulogium of ours to appear needful; yet as his Grace was, we believe, one of the first to adopt extensively bones and other light manures as a tillage, and has been for a long series of years ever ready to make any experiments, the pursuit of which might tend to advance the interests of agriculture, spending most freely large sums of money for the promotion of such objects, it is most assuredly due to his Grace to acknowledge in how great a degree, not this county only but the country at large, is indebted to his science, skill, and enterprise. Whatever the late Earl of Leicester did for Norfolk the Duke of Portland has done for Nottinghamshire, and so generally is his liberality

appreciated throughout the county that we feel convinced we should not be deemed to have done our duty if we had not thus alluded to it.

That a great and important change throughout the district has been wrought during the last half century is an indisputable fact, and as such it cannot be uninteresting to investigate more closely the causes which have produced it. The improvements which have been introduced were obliged to be not only gradual but expensive. When the forest land, as it is termed, is first broken up, the colour of the soil, often nearly pure sand, or mixed with gravel, is yellow and unpromising to the eye; neither does it assume the appearance which usually indicates fertility until it has been under cultivation many years. To enter into details of the various means, so far as labour has been employed, which have been adopted for bringing these soils into cultivation, would be to ring changes on grubbing and ploughing, and would not only be tedious but unprofitable. It is more to our purpose to observe that the actuating principle has been to furnish food for sheep. The Spaniards have a proverb, which it is to be feared is almost lost to their recollection now, that "wherever the foot of the sheep touches, the land is turned into gold;" and however rhetorical such proverb may be, it contains, we believe, the operative cause of all the improvements which have taken place during the period to which we have alluded. On land which will bear to be trodden by sheep at all seasons, which is the case here, no mode of improving poor soils has yet been found so effectual; consequently, the first object of the occupier is to furnish food for his sheep at all seasons; and as the turnip forms, in a great measure, the object in question during six months of the year, it is to the production of that root especially that he directs his attention.

It is to the introduction of the swede turnip that the improved state of farming in Nottinghamshire must be mainly referred. This it is which forms the farmer's sheet-anchor during at least 4 or 5 months, and those the most trying of the year, for the support of his stock.

This invaluable root was, if we are rightly informed, introduced into this county about the commencement of the present century, by the late Colonel Mellish of Blyth; and small portions of seed were distributed by him to the leading agriculturists of that neighbourhood; but as the improved mode of growing turnips in drills was then quite unknown, the success attendant upon the first essays of these gentlemen is said to have been very limited: neither were the results of their efforts of so much value to the animals for whose sustenance they were provided, as might have been supposed. Besides, no implement for cutting the turnip was at that time thought of; and we have been informed by an eye-

witness that the sheep to which they were given, not being able, without great difficulty, to eat them—doubtless, in part, from their imperfect growth—they were removed from the ground, and pronounced to be, with due respect to Colonel Mellish, a very unsatisfactory article of food to be provided for animals which had not the power to make a meal of them. But as their culture was improved, and machines at length were introduced for slicing them, they obtained that place in the estimation of the farmer which they well deserve, and have ever since held. Indeed, so highly is the swedish turnip estimated on the light soils, that it forms *the* criterion by which to judge of the degree of cultivation upon any farm: and amply have the farmers of these districts made amends for any deficiencies in their first attempts, by the success which has since crowned their efforts; for we hesitate not to say that heavier crops can be nowhere seen than in some districts of this county which in the recollection of persons now living were deemed too poor to repay the expenses of cultivation.

It would be anticipating our subject to enter at present more fully into the means employed for the attainment of an object of such primary importance; we will only observe here that the expenses incurred in the cultivation of this particular crop, important as it unquestionably is, are not estimated by the mere actual value of that crop, but success attained here is regarded as an earnest of success in each crop throughout the ensuing course. And we could not but be struck with the following fact, in a ride we took through the county in the month of November last, that we found the turnip crop more uniformly good after a season of drought almost unprecedented, on the western side of the county, than on the eastern and southern sides, although the soils in the former are much more liable to suffer from a dry season than either of the latter; from which we could not but arrive at the conclusion that capital had been more freely expended upon these districts where success had been the greatest, otherwise a superiority would not have been found where it was least to be expected; an expectation founded on a full consideration of the means employed, to which the results must always be correspondent.

And here it may be very naturally asked, on the assumption that such splendid crops of turnips are produced and are in time succeeded by those of grain of equal excellency, on a soil by nature so poor, by what means has a change so happy been effected? To such question we would reply, that it will form the subject matter of this Essay to enter as fully as possible into the means so used; and we will only say in concluding these general remarks, that the first great impetus given to the farming of this county was by the introduction of bones as a manure.

It is self-evident that land which was too poor in the first instance to produce anything useful, could not without extraneous aid yield what was necessary to improve its first condition : added to which, considerable tracts of these soils lay too far removed from any large towns which otherwise might have furnished, at least in some measure, the means necessary for their improvement ; but through the medium of bone-tillage and other light manures, the face of this extensive district has been within the present century entirely changed.

Bones were originally very cheap, and as their effects were strikingly manifest to all who made use of them, they were, until the increasing demand for them raised considerably the price, most lavishly used. It was thought by many that as the quantity used was increased, the effect would follow in the same ratio ; and considering how little science in its application to agriculture was then known, we need feel no surprise at an opinion so erroneous being entertained. At length, however, it became evident to some intelligent minds that they were riding too freely a favourite hobby ; and it was asserted that the "land required change." The Duke of Portland was one of the first to direct attention to this fact, by publishing the result of experiments carefully made on his own farms, which tended to show that by repeatedly applying bones to the same soil, the good effects which resulted from their first application were almost or altogether wanting, owing to its repletion of phosphate of lime. Then it was that the farmer began to look out for substitutes, and hence have followed the long list of artificial manures in their various forms.

The course of cropping usually adopted in the western division of the county is the Norfolk, or four years course, namely,

1st year, turnips.

2nd year, barley.

3rd year, grass seeds or red clover.

4th year, wheat.

First Year, Turnips.

As soon as the wheat crop is removed the preparation immediately commences for the crop of turnips, by giving the land one, two, or even more *orders* or workings, as it may be necessary or convenient during the dry weather of autumn. This is now most commonly done by putting on the scarifier, which is in general use throughout the district ; the land being again crossed by the same, and afterwards worked by lighter harrows until the quitch-grass is ready for being got off. It was formerly the custom to burn this on the ground after being raked together ; but it is now more generally, by good farmers, carted away and put

into a stack, and after remaining there until dry, used as a bottom for the manure in the yards, where it is useful in absorbing the drainage of urine.

This method of using the quitch-grass has been objected to, but we think without sufficient force, on the ground of its being liable to grow afterwards: to obviate this it is only necessary to see to its being dry before it is so applied.

It was the practice of an excellent farmer to apply salt by way of assisting the process of decay; and we doubt not that the idea is well worthy of the attention of all who desire to make as much manure on their farm as possible,—which certainly will be the object of every farmer who duly estimates its value.

If the season is favourable for cleaning the fallows, when they receive the last ploughing before winter, they are not unfrequently so perfectly tilled as to be in a fit state for the reception of the seed, which on the dry soils of Nottinghamshire is an advantage that can scarcely be too highly estimated, or too much sought after. As the winter rains then succeed, the land requires to be but little disturbed in the following spring, but remains cool, and is far more certain of producing a crop of turnips than if exposed by repeated ploughings during the drying months of the spring season.

In the winter months as the manure is made it is carted out of the yards into the fields where it is intended to be used in the approaching season for the turnip crop. There are various modes of preserving it during the interval which ensues. The one we are inclined to believe the best is, to have it thrown up into hills out of the carts by hand, and not, as is more frequently the case, run upon by the carts, to prevent thereby—what is, after all, an erroneous idea—its overheating. By throwing it lightly together the fermentation is equal throughout, and will be found so when it is again disturbed. Instead, however, of allowing the gases to escape by exhalation, we would, by all means, recommend a covering of soil to be thrown upon it, sides as well as top, of not less than 6 inches deep: by which means those gases are repelled back upon the manure itself, and there fixed, instead of wasting themselves on the “desert air.”

Manure so treated will require nothing more doing to it until within a fortnight or three weeks of the time of using, when it ought to be turned, and again covered with the same soil. The expense of covering is very trifling, the advantage attendant upon it very great. There is no need to cart the soil from a distance, but only to make a trench round the manure, the same as if covering potatoes for the winter.

The usual season for sowing the swede turnip commences the last week in May, or the first in June, and continues till about

the 20th of the latter month. If sown earlier they are liable, on the dry soils, to mildew; if later, they frequently do not attain the same size which they otherwise would. Some experienced farmers prefer a rather late season, from the circumstance of the late sown turnips being mostly of better quality than those sown earlier. Presuming on the land being perfectly clean, and free from quitch, the usual method is to throw open drills for the reception of the manure, which is done by a common swing plough, in most general use throughout the county, drawn by two horses abreast. The distance between the drills should vary, with the quality of the soil, from 22 to 27 inches. The better the soil the wider the drills may be drawn, as the plants will be larger, and consequently require more room to expand in. The manure is then carted on by one-horse carts from the hills, as described above, in quantity from 10 to 15 loads to the acre, as it happens to be plentiful or the contrary, or as the farmer may wish to reserve it or not for other purposes. Women and boys then follow, for the purpose of thoroughly dividing and equally distributing it in the drills. If the manure has been well made in the yards, and afterwards treated in the manner we have described, it will present a black and oily appearance, retaining considerable heat, and giving every indication of strength and goodness. The ridges are then immediately split by another plough, covering in the manure as quickly as possible, which at this season of the year, when evaporation goes on rapidly, is an object of paramount importance. The Northumberland drill now follows upon the newly-made ridges, whilst the mould is fresh and moist, depositing, at one and the same time, *although at different depths*, the seed and such hand manures as may be used. The quantity of seed sown on the acre ought to be varied according to the state of the soil at the time of sowing, and the general character of the soil. On the light soils, if sufficiently moist, every seed may be expected to vegetate, and even then not less than 3 lbs. ought to be sown; but on the stronger soils, which lie more open, and upon which it is, in consequence, more difficult to secure a sufficiency of plants, not less than 4 lbs. should be sown.

We are aware that many will consider this an unnecessary quantity; but, supposing the whole to grow, which is seldom the case, it is only to introduce the hoes somewhat sooner. Plants are much easier thinned from a superabundance than supplied when wanting, particularly on dry soils, where transplanting is attended with uncertainty; and in favour of a large quantity of seed we may cite the Northumbrian practice, which is high authority on the subject.

Amongst a great variety of hand manures now in use the most common are bones ground either to what is called "dust," or to

“half-inch,” that is, left in pieces of about that size, and rape-dust mixed with them, which serves to quicken into action their dormant powers. Many substitutes have, however, of late years been made use of, which we propose to notice briefly afterwards, and will only observe that the dressing supplied for the turnip crop forms a very heavy item in the farmer’s annual expenditure. In 1842 the present Mr. Milward informed us that he spent that year at Babworth, upon 170 acres of turnips, from 50s. to 70s. an acre, and even more than that sum, for the greater part of his crop was swede turnips, which received half-a-ton of rape-dust to the acre, at a cost of 7l. 7s. a-ton, the price current for the year. The turnips were, however, good in proportion, insomuch so that, the great breadth considered, and the quality of the soil upon which they were grown, they were the best we have ever seen. I have heard Mr. Milward observe that he has spent upon the same farm, consisting of about 550 acres of arable land, upwards of 600l. in linseed-cake in one year; and, supposing the half of this cake to have been consumed in the yards by beasts, and the manure applied to the turnip crop, the two items form together a very heavy outlay of capital.

But it may be urged that the case here adduced is an extreme case, and a solitary one, and that the farming of an individual forms no criterion whereby to judge of a district. But to such a remark we would rejoin, that it is by no means a solitary case; that, on the contrary, there are many tenant-farmers in the same neighbourhood who are farming with equal spirit; and that such a degree of cultivation amongst the sand-land farmers forms the rule rather than the exception.

As soon as the young plants are large enough to admit the horse-hoe no time is lost in stirring the ground effectually between the drills, as it is found that their growth is thereby greatly accelerated. They will now soon be ready for striking with the common hoe across the drills, for the purpose of thinning the plants. This ought to be done by an experienced man, followed by a boy or girl, to leave single such plants as he may not have been able to separate with the hoe. The usual distance at which the plants are left apart is from 9 to 12 inches; and a hoe of a size not less than 9 inches should be used if the plants are to have sufficient space in which to develop themselves. This work is frequently performed by the piece, at about 4s. the acre, and cannot be done for less to allow fair wages. In a few days afterwards a second horse-hoeing will be required, and not improbably a third, as well as being gone over a second time by the hand-hoe, although at much less expense than the former one, the object of this latter hoeing being chiefly to eradicate any weeds which may remain.

The season for sowing the common turnip in its several varieties is from the middle of June to the middle of July, although they are sown as late as August on land which has grown a previous crop of tares. These late turnips, with good management, form the most nutritious feed for the lambing ewes during the early spring season. A mixture of "white globe" and "purple-top white" is often sown for early feed in the autumn. The "green globe" is an excellent kind to succeed, and possesses this advantage, that it will bear the winter nearly as well as the swedish turnip itself. The routine of cultivation for the common turnips is similar to that pursued for the swedes, excepting that they do not require the same high management that the latter do. Neither have they, in general, the same space allowed, either between the drills or the plants themselves. Some prefer to sow them on the level furrow, and not upon ridges: such is Mr. Milward's practice. After the land has been brought to a smooth surface it is manured, and the manure immediately ploughed in by a common furrow. The seed is then drilled in, and also the tillage, by one of the large Suffolk drills, at a distance of not more than 18 or 20 inches between the rows. Drilling on the flat has two advantages over the ridge method. The hasty showers in summer do not run from the roots of the plants so easily as when sown upon ridges; and it also admits of the turnips being drilled much nearer between the rows, which in the white turnip is of service, inasmuch as where upon ridges only three rows could be had to secure the benefit of covering the manure better (which is the principal advantage possessed by the ridge system), four may be included in the same space; and, although the turnips may be smaller in size, they are of far better quality. The horsehoe may be used within drills of 18 inches, but not at less, without danger of injury to the plants. Two pounds of seed is generally thought enough of the common turnip to the acre.

The early-sown turnips are generally ready to stock during the month of September, which is mostly done by turning lambs upon them. These have been previously taught by the ewes to eat linseed-cake, and have an allowance of a quarter of a pound each until Christmas, which is then increased to half a pound, if they are intended to be sold fat in the spring: a practice followed now very often, at least as regards the wethers. The choicest gimmers are more frequently reserved for breeding ewes: a proportion of one-fourth or one-fifth being supplied each year, by which means the flock of ewes is always young.

Second Year.—Barley.

Of late years it has been common, from the very low price of barley, to sow all the early cleared turnip land with wheat, either

as soon as the turnips are eaten, or during the succeeding month of February. This practice appears to some persons open to objection. If half the turnip land is sown with wheat instead of barley in each year it will, in due time, bring the whole of the land to produce wheat three times instead of twice in eight years, or during every two courses; and whether the weak soils of this county are capable of supporting the practice permanently is the point on which some cautious minds demur. That it is desirable for all land to have as frequent change of cropping as possible, so long as such change is attended with profit to occupiers, none will venture to deny. The respective prices of the two kinds of grain for the time being will go far to determine for or against the practice. And whilst farmers, who have made so great an outlay on their turnip crop, can, as we have known to be the case, grow 40 bushels and upwards of fine wheat to the acre, instead of perhaps as much barley—worth only two-thirds the price of the wheat, and with far less risk of being spoilt in the harvesting—they will not fail to regard present profit notwithstanding a contingency of future loss.

The land intended to be sown with barley is ploughed as soon as cleared of the turnips, to prevent waste by evaporation of that manure which has been left by the sheep, and also its being washed by heavy rains irregularly upon the surface. The land should then have a second ploughing before the barley is sown, as it is found to ripen more equally after two ploughings than one, and also, we think, to withstand the drought more effectually if the following summer should prove a dry one. The season of sowing seldom commences before the 20th of March, and even that is earlier than many will sow, lest the frosts should injure the plant when young. The largest breadth is sown during the early part of April; the season continues, however, up to the month of May, but the quality of the produce is mostly inferior when sown thus late. The most generally approved kinds of seed are the Welsh and Chevallier. The quantity of seed sown varies with the mode of sowing; if sown by hand, which is the practice of many, upon the common furrow, and harrowed in by the drag-harrow, from 14 to 16 pecks an acre are used; but if drilled not more than 12 pecks are necessary.

Third Year.—Grass Seeds, or Clover.

The grass seeds are sown most frequently at the same time with the barley, although the prudence of the custom is, we think, questionable, and has not received the consideration that it deserves. It is said that if seeds are sown thus early with the barley they take so much better than if sown later; and the practice is, on that ground, defended, without, perhaps, at all weighing

the serious injury that is occasioned to the barley by such rampant growth of various plants at its roots. Is it not probable that the exuberant growth of clover, and its accompanying grasses, is equally hurtful to the cereal crop, whether wheat or barley, with the exuberant growth of so many weeds, if they were permitted, but which are, by all good farmers, carefully removed? Another great evil in allowing the clover to make so much head arises from the increased difficulty of harvesting well the barley crop. Now, by drilling in the barley in the first instance, and when it well covers the ground to hoe in the clover seeds, will, in our humble opinion, in most seasons be found far better as regards the grain crop, and not, in the end, much worse as relates to the seeds. Of red clover 12 lbs., with half-a-peck of rye-grass, to the acre is generally found sufficient. For summer pasturage is required of white or Dutch clover 10 lbs., with 2 lbs. of rib-grass, and 2 lbs. of trefoil, accompanied by 2 pecks of dwarf rye-grass.

The season for cutting the early-sown barley is rarely retarded beyond the last week in July or the first in August. This is most commonly done by the scythe, which is followed by a woman, who gathers the mown corn into sheaves by means of a rake having three or four long iron teeth; she places the sheaf upon a straw band, made usually by one of the children. The man then binds the sheaves, and, as he returns to the point from which he started, the woman carries his scythe. In this manner an active family will clear 5 roods in the day, for which they receive from 5s. to 7s. 6d. an acre, according as the crop may be light or heavy, including the stooking and raking afterwards.

From the more than ordinary scarcity of pasturage which the occupier of these dry soils has to contend with during the months of August and September, he is generally obliged to stock the young clover during the autumn, and, perhaps, if not eaten too low, it may be benefited by the treading of sheep, more than injured by the pasturing. It is, however, the invariable custom to clear the ground before the severe frosts come on, and to allow nothing to go upon them until the following spring, when they are required for the ewes and lambs. With these they are, in most cases, stocked; and, when an allowance of half-a-pound of linseed-cake to each ewe is made, they will often carry five or six ewes and their lambs to the acre up to weaning-time, but the number kept depends much on the moisture of the season. The red clover is generally mown for fodder for the working horses during the winter months, the after crop being reserved for the lambs when weaned. The propriety of pasturing lambs on the second crop of red clover has been much debated, as great losses frequently ensue from it; such, in particular, has been the case

on some farms during the present year. It has been suggested, and we think with good reason, that the danger arises from its being done when the clover is too young, which induces flatulency and disorder of the stomach and bowels, and ends in diarrhoea, which often proves fatal to lambs at that season of the year.

It has been almost the universal practice to allow the grass seeds to remain down for pasture two years, and often longer, before the land is ploughed up for wheat. An opinion now, however, prevails in favour of ploughing it up after one year, as it is found that as much wheat can be grown after one year's seeds as upon those of longer growth, which, perhaps, may be accounted for on the ground of the fibrous roots of such seeds as are the growth of one year being sufficient for the support of the succeeding wheat crop: whereas, when of longer standing, a season commensurate is required before the roots can decompose, and become available matter for the support of other plants. The red clover is seldom allowed to remain down longer than one year, doubtless from the circumstance of its deteriorating more than the white after that time.

Fourth Year.—Wheat.

The season for sowing wheat on the warm soils of this district commences now much later than it formerly did. Very little is sown before the last week in October, but November is the principal month for this important operation. The customary mode of preparing the ground is by ploughing and pressing the clover ley, one presser following two ploughs. There is no neater mode of performing the work when it is well done. It is, nevertheless, objected to by some good farmers, on the ground that the grass is liable to grow up between the furrows, so as to interfere materially with the after growth of the wheat. The almost universality of the practice in the district seems to furnish an argument against that objection. It has, however, been met more effectually by a plough invented some years ago by Mr. Hodgkinson of Morton Grange, which is termed a "skim-coulter plough." The advantage he proposed was, that it should take off a thin furrow from the surface before ploughing the main one: the sward would, by that means, be effectually disposed of by being thrown to the bottom of each furrow, and could not grow through to the injury of the wheat. The whole is performed by one plough, which requires four horses. Its adoption would certainly increase the labour of the wheat seed-time, but it would, at the same time, carry out a most important principle of good farming, we mean that of deep ploughing (to which it is, undoubtedly, a preliminary step), on almost every kind of soil. Deep drilling

follows of necessity on deep ploughing, which is an object of the last consequence on soils liable to suffer from drought.

The quantity of seed sown is regulated by the quality of the soil, less being required where the soil has strength to cause it to tiller during the winter months. Few sow less than 9 pecks to the acre, and on the light soils as much as 12 pecks is sown. The amount of seed is a subject that has been too often discussed to leave room for much that is new to be said upon it. We may, nevertheless, observe that custom in this district has fixed upon about 10 pecks an acre as the most desirable quantity. If sown thick the ears will be small, and the yield, regarded individually, will be found defective. If, on the other hand, it is sown not thick enough, an increased expense is incurred in hoeing to keep down the weeds, and nature, in seeking to supply what is wanting, will continue to throw out, as the roots gain the requisite power, a succession of ears until so late in the season that it will be impossible for the crop to ripen uniformly: the inevitable consequence of which will be an undue proportion of small and defective grain in the produce.

White wheat in its several varieties is almost exclusively sown on the sands, and the one which for some years has taken precedence of all others, at least in the northern part of the county, is "Hunter's White Wheat," in favour of which so strong a feeling exists, that it is thought by many to be unequalled for this soil and climate. So great is its popularity, that it is extending its fame generally throughout the cold soils of the clay districts, on which at one time white wheat was seldom or never attempted to be grown. It is held in high request also by the millers, from whom it commands the best price. It would be difficult to give a decided opinion on the average produce of the wheat crop; but we may nevertheless state, that on well cultivated farms of ordinary quality it is seldom below 30 bushels an acre; and on the higher farmed land of good quality, not much, if any below 40 bushels.

Of barley, the fluctuation in produce is greater as the season suits it or otherwise. On the average, it may be stated at $4\frac{1}{2}$ quarters, although in some instances a field will yield 7 or 8 quarters an acre.

The harvesting of the wheat crop is now more frequently done by the scythe than by the sickle. The work is performed as described in the harvesting of barley. Mowing has several advantages over reaping with the sickle. It is cheaper, far more expeditious, and clears the ground at once of all stubble and weeds. If well done, the grain is found not to suffer so much in wet weather as when reaped by the sickle, which may be easily accounted for by its being looser in the sheaf, which allows the

rain to pass more easily through it. From the same cause it admits more freely the sun and wind, and is in consequence sooner ready to carry. A strong prejudice existed for some years against the practice, but it has now given way, the advantages being too decided to be any longer doubted. The price is from 6s. to 8s. an acre, and occasionally 9s. may be given, which includes mowing, taking up and binding the sheaves, as well as taking up and binding the rakings.

Oats are not much sown on the sand lands; a crop is sometimes taken after two years' grass seeds, as fodder for the working horses; the land being afterwards manured and sown with wheat. In general two white crops in succession are opposed to good farming; but when the land is in high condition, and obtains an extra dressing of manure as compensation, it cannot reasonably be objected to.

Peas both white and grey are occasionally sown in the place of the red clover crop, under an impression that the land in the following course will be more certain for clover. They are drilled wide so that the horsehoe may be applied. A single crop of peas is not unfrequently taken after the wheat crop, the land being fallowed the succeeding year for swede turnips.

Vetches are sown extensively for soiling the working horses during the summer months. Those for early mowing are sown on the wheat stubble as soon as that crop has been removed, and are protected during the winter by an admixture of rye. A succession of crops is provided throughout the season; the land, as we have before stated, is sown with white turnips as soon as it is cleared of the vetches. The most economical manner of using vetches is to cut them with a proportion of dry fodder; the horses will, when thus fed, go through their work much better, and be less liable to suffer from disorders of the stomach and bowels, occasioned by feeding too freely on them in an unmixed state, when they return hungry from their work.

On most of the large farms, the cutting of chaff for horse food is performed by horse power.

In some instances steam-engines have been erected, which in addition to the cutting of chaff, thrash out the grain, as well as grind what is necessary for the use of the farm. Earl Spencer has had one on his farm at Wiseton for several years past. Mr. Smith, of Gringley-on-the-Hill, has lately erected a small, but complete engine, which is capable of thrashing out about eight quarters of wheat an hour, and is made applicable to several other useful purposes. These, and more which might be mentioned, we doubt not will be but the forerunners of others, as the necessity for economy in every department of labour shall become more urgent.

On referring to Mr. Lowe's Report upon the State of Agriculture in Nottinghamshire in 1794, we find mention made of practices adopted at that time by certain individuals, which bespeak an intelligence and enterprise much beyond their day; as for example, the application of bones at the rate of 50 bushels an acre to the turnip crop, and of rape-dust at the rate of half a ton an acre: those individuals possessing moreover the foresight to determine on the four course system, as the best adapted to the district, when, after so many years' experience, it has become universal. These persons had also the sagacity to perceive the great superiority of the Leicester sheep over the other breeds then known in the county, and spared no expense in bringing it to perfection. It must be confessed that such statements of the farming of fifty years back, are calculated somewhat to startle us, when drawing a comparison between it and the agriculture of the present day. In carefully revising Mr. Lowe's report, however, we think it clear that the instances he there adduces of such spirit and intelligence were confined to the practices of the few, and formed little or no part of those of the many.

In every age are found persons gifted with minds superior to the mass of those around them, who anticipating improvements, the necessity of which is not admitted by their neighbours, shape their conduct by their own convictions, indifferent to the prejudices of others.

We have no wish to become detractors from what is justly due to our ancestors of the eighteenth century; but we think that very little reflection is needed to show that their movements must of necessity have been confined within a narrow circle by the disadvantages with which they were at the time surrounded, which disadvantages must have formed an almost insurmountable barrier to anything approaching a perfect system of farming.

When a considerable portion of the county was unenclosed, when the art of drainage was all but unknown, and at a time when the prime virtue of the husbandman was the observance of a rigid economy; far too rigid, we should imagine, to allow of that liberal investment of capital which has since proved the foundation of all the essential improvements which have taken place—with all these disadvantages, and especially the want of requisite information on subjects in general connected with his profession, on which science has since thrown light and knowledge;—we cannot but infer that the agriculture of 1794 must have been, as compared with that of 1844, very defective and imperfect as a whole.

Sheep.

The pure Leicester, or a cross of that with the larger framed

animal from Lincolnshire and the Yorkshire wolds is the general stock of the county. Nottinghamshire has long been famous for its superior breed of sheep. Mr. Lowe makes mention of the names of several celebrated breeders of Leicester rams, chiefly resident in the southern part of the county, who were, at the time he wrote, going to great expense in improving the breed of sheep; giving even at that time as much as 100 guineas for a ram. It appears from his report, that Mr. Bakewell's celebrated stock had then been introduced about twenty years. The spirit infused by that eminent breeder has, we believe, been unceasingly at work ever since. It is well known that the late Duke of Bedford once hired for the season a ram of the late Mr. Buckley, of Normanton, for the sum of 800 guineas; and also, that Messrs. Thorpe, Dudding Loft, and Marris, paid to the same gentleman 1000 guineas for the hire of a ram. The success of Mr. Burgess, of Holm-pierrepont, at the last Christmas show in London, will alone prove the high place he holds in the present day, not only as compared with his neighbours, but as challenging competition with the country at large. And although these names belong more properly to the other division of the county, their owners are honoured, and have their merits recognised, alike in both.

Nearly every farmer in this western district is a breeder of sheep. The country is more adapted to the support of that animal than to any other; and it is doubtful whether so certain a profit is attainable by any other method of stocking a farm as by the farmer *raising* his own flock. For the difference between the price of poor stock, and the same animals when made fat, has of late years been so small, as not unfrequently to leave little or no profit to the person in whose hands that change has been effected. On the other hand, the fault of those who breed lies too often in breeding more than they can well keep at all seasons, and thereby materially lessening their profits. We are convinced that any infringement of the above as a rule, will assuredly in adverse seasons be attended by greater loss than is ever made amends for by the profits of more favourable years.

We have before observed that it is the general practice to sell the wether hogs fat before Midsummer, when, without any great forcing, they will frequently attain a weight of from 20 to 22 lbs. a quarter, their fleeces averaging from 7 to 9 lbs. To bring about this result when allowance is made for the number kept on the acre, no time must be lost, and it can only be accomplished by giving them fruitful pasturage on clover seeds during the summer, and by putting them early to turnips in the autumn, with an allowance of linseed-cake or corn, mixed with culm or chaff, to meet the wants of the animal, during that season espe-

cially when it is fed on the turnip, a food not natural to it, and for that reason requiring the assistance of some such auxiliary.

During the several years when there was an annual prize show at Blyth (which is now discontinued), the animals from this district exhibited there, might have borne comparison with any others that could have been brought against them. The show took place in May, at the fair which is held during that month. The competition was between the exhibitors of the best pen of 20 wether hogs, clipped. The age of the sheep would then be about 15 months. The weights to which those animals attained were in some instances 35 lbs. a quarter, and even more. Amongst the most successful of those competitors was Mr. Allison, of Bilby, who has for many years distinguished himself as a breeder of pure Leicester sheep. We mention the above only to show what may be obtained by superior blood, with unremitting care and attention.

Southdowns are kept on some of the large estates, but they do not obtain a place amongst the general stock of the county. We greatly doubt, indeed, in opposition to all that has been said to the contrary by the advocates of Southdowns, whether they can compete with the Leicesters, age and weight considered. We made an experiment some years ago between the two, placing them as far as possible on an equal footing, and the result determined itself greatly in favour of the Leicesters. When fat lambs are wanted for an early market, the Southdowns possess an advantage, by being more hardy, more prolific, and nursing their lambs better than the Leicester ewes; but where the lambs are required to be wintered, and then go to an early market, they fail in both mutton and wool; their habits are more erratic, they want the quietude which the Leicesters possess, and which contributes so much to their being made fat.

Before we quit this subject, we cannot but briefly advert to the greatly increased number of sheep now kept in this district, compared with the time when Mr. Lowe wrote. Many persons can remember, subsequently to that period, when forest farms of 300 acres of land had not more than 50 ewes upon them, and these of an inferior kind, and that much difficulty was often experienced in supporting them through the winter. These same farms in the present day, as we can bear testimony, support from 500 to 700 sheep throughout the winter—the greater part of which are sent fat to market at weights of from 80 lbs. to 120 lbs. each.

We need scarcely observe that the breed of sheep known formerly as the one peculiar to this district, and called "The Forest Sheep," is now nearly extinct. Judging from the general appearance of the few which remain, they indicate an animal more

likely to endure hardships than to repay any expenditure in attempting to improve it.

Beasts.

As there is but very little permanent grass land in this district, the number of beasts kept is greater during the winter than the summer months. Many of the farmers sell off almost all they winter in the spring months, to the summer grazier, and buy in again to supply themselves in the following autumn. When the turnip crop is an abundant one, the number of fat cattle sent to market throughout the winter is very great. When that crop is less abundant, much fewer are made fat, the farmer's attention being directed chiefly to the converting of his straw into good manure, without drawing many turnips to be consumed in the yards. Any profit that he might realize on the feeding of cattle, he well knows would be more than counterbalanced by a diminished crop of barley, where such turnips ought to have been eaten on the ground. He accordingly contents himself with preparing beasts for the summer grazier by sending such stock to market in good condition, rather than by fattening them himself to the injury of his farm. This he does by giving to each beast a moderate allowance of linseed-cake, varying from 4 to 6 lbs., according to their size, other circumstances also being considered. The animal is thereby kept healthy, and with only a daily allowance of 4 lbs., which is the minimum of what ought to be given, will at least maintain its condition. Each beast will thus cost during the six winter months from three to four pounds, more or less, according to the price of cake at the time. When, however, the farmer has in prospect his next year's turnip crop, and looks still beyond to the barley crop which is to succeed, a proportion of his beasts will most probably be allowed 8 lbs., and such as are being made fat, from 12 to 16 lbs. each, which will impart a power and goodness to his manure, visible wherever it is applied for years afterwards.

The best farmers have long since ceased to give cake to their stock, at those times only when they find a profit on that stock to justify them in doing so. They now look upon the conversion of their straw into the best possible manure as an object of the highest importance to their farms. They calculate how they shall use the greatest amount of cake, which they regard as an indispensable in good farming—at the least possible loss; for, as prices both of beef and mutton have of late been, they must necessarily incur a loss if they expect their remuneration from the live stock, instead of from the land. The farmers take a wide view in this matter, and we think regard their interests in their true light. Mr. Pusey has observed, in his spirited description

of Lincolnshire farming, that there the cattle are looked upon only as "machines whereby to make manure," and upon the same principle does the Notts farmer act when he considers his straw, which increases year by year with the improved condition of his farm, as a "vast number of tubes," whose use is to be filled with liquid manure, and carried out to the support of his future crops.

Beasts are bred to a greater or less extent on most farms, the only breed being, with few exceptions, the Durham, or as they come now to be styled, "the Improved Short-Horns," of which the county can boast some of the best specimens in the kingdom. Earl Spencer's celebrated herd at Wiseton is too well known to require further notice here than to state, that we believe his Lordship continues to feel an undiminished interest in that department of farming. Mr. Parkinson's herd of Leyfields, near Newark, has also acquired a high character, to which it will be admitted to be fully entitled, by all who have seen it. Mr. Parkinson is owner of the celebrated bull, "Sir Thomas Fairfax," to which was awarded the first prize, as the best short-horn bull, by the Royal Agricultural Society in 1842. Mr. Watson, of Walkeringham, has in the course of a few years attained great eminence as a breeder of short-horn beasts, and is in possession of a bull, "Lord Adolphus Fairfax," of perhaps equal merit with his sire, "Sir Thomas Fairfax." These herds are well known amongst breeders, but the county has many others of less fame, though of distinguished merit, to which we only allude for the purpose of showing that their influence must have been very great on the general stock of the district. The most cursory observer has only to walk through any cattle fair in the county in the present day, to be struck with the improved appearance of the stock of all kinds, compared with what could have been seen a few years ago.

Calves are reared both by the pail, and by sucking the dam, or a foster-mother; but the point which appears to require most attention in the perfect rearing of any kind of stock, consists in promoting without any check, a continued progression after weaning, without any loss of condition at that time, or indeed at any time afterwards. An instance of the effect of such a mode of treatment was given us some time ago by Mr. Brooke, in a large lot of bullocks, fed on the farm of the Hon. John Simpson, at Babworth, which averaged when about two years and one month old, upwards of 60 stone each of 14 lbs. to the stone.

Pigs.

Those who have pursued farming more as an amusement than from any profit to be derived from it, are observed generally to have evinced a greater disposition to improve the breed of pigs

than of any other animal. It is especially the poor man's property, and this may account for the additional interest which has been taken in its improvement. Certainly no other animal has been subjected to so complete a metamorphosis during the last 20 years. Instead of the long-eared coarse-foaled animal, which was common formerly, and which was as difficult to make fat as it was hard and unpalatable to eat when so made, may be now seen a compact creature, with small ears, short snout, deep in the sides and thighs, with legs short, and seemingly unequal to support the superincumbent weight which it is their office to carry.

It has been often said by various judges at the local agricultural shows in this county, that the show of pigs has been superior to any thing they have witnessed in any other part of the kingdom. And yet with such celebrity, we are quite at a loss by what term to describe the peculiarity of breed. One of the best breeds with which we are acquainted was supplied by the late Mr. Fowkes, of Barmborough Grange; it has been bred very closely, and without a single cross from any other source for more than 30 years. The breed to which we allude is that of Mr. Crofts, of Blyth, from which has emanated much of the best blood in the district. Viscount Galway has also a very superior breed of a similar caste, at his Lordship's seat at Serlby, which combines with great size the best quality, being quite equal in that respect to the Neapolitan or Chinese, yet in its general character bearing little affinity to either; possessing a larger frame, attaining with nothing beyond ordinary keeping at 14 or 15 months old 25 stone and upwards. This breed of pigs has the greatest possible aptitude to fatten, and is made fat at the least possible expense; a merit which the cottager has discovered and fully appreciates. In default of a better distinguishing title, it will be no misnomer to call it *The Improved Nottinghamshire Pig*.

Horses.

In this district the ploughing is invariably done by two horses abreast. The horses in general use are of a more active kind than formerly, being found to get over the ground much quicker than the old Lincolnshire breed, which in this part of the country is now nearly extinct. Many of the mares have of late years been crossed by a Cleveland stallion, brought into the county at a great expense by Mr. Watson, of Walkeringham, whose spirited exertions in behalf of agriculture in every branch are well known. This cross has unquestionably been an excellent one for the light soils, by imparting to the ploughing horses a mettle and speed which they before wanted. Many however of the farmers buy their horses as they require them, at 2 or 3 years old, of the

graziers of the Trent side district, where the permanent grass land offers a more suitable pasturage than the sheep-walks of their own.

Premiums are given also for blood horses by the Agricultural Societies; but they do not receive much attention from the majority of farmers. With the late increased demand for good horses, both in the home market and on the continent, the prospect of remuneration in that department has been certainly equal to any other. The farmer looks, and not unwisely we presume, at the long period of five years, which must elapse before the animal is marketable, and also at a certain risk during that length of time, with perhaps an uncertain profit at the end of it. Any speculation which requires such a length of time to decide it, does not, we confess, present a very encouraging field to enter upon; nevertheless, if the first principle of breeding be looked to, which is that "like produces like," and we were to expect good ones only from good ones, we believe that the uncertainty would be much lessened.

The Yorkshire Wolds have been long regarded as the nursery for our best blood-horses, the breeding of which has there been considered lucrative, from its being confined to such horses only. The degree of success will depend much on the stallions introduced into the district being of first-rate character; but as these are a class which can only be had for high prices, and which it does not suit the generality of breeders to supply, they must be introduced, if at all, by the wealthy and influential.

Limestone District.

The Western Division includes a district of limestone soil forming a narrow slip of land adjoining the county of Derby, to which it more properly belongs from the greater resemblance it bears to the soil of that county. It is described by Mr. Lowe as a "hungry limestone;" and although some parts of it have been much improved by drainage and by the use of bone-manure, it is still wanting in that natural productiveness which distinguishes some limestone soils. The limestone contains a large amount of magnesia, which is alone sufficient to account for the want of natural fertility.

The course of cropping on the dry and sound parts is,—

- 1st year, turnips.
- 2nd year, barley.
- 3rd year, clover or peas.
- 4th year, wheat.

Sometimes oats are sown after the wheat; but this is a practice which is decidedly objected to by the best farmers of the district. This dry and sound land may be cultivated with a prospect of

remuneration to the occupier, which can scarcely be said of the wet and cold parts still requiring drainage. On these soils, instead of the turnip crop, the farmer must have a naked fallow for wheat or barley, which is succeeded by clover in the third year, and afterwards ploughed up for wheat or oats.

Where drainage is wanting, it is a precarious district to farm, and one but little sought after; neither can the tenant be expected to improve materially a soil lying under such natural disadvantages, unless the landlord comes forward to his aid by giving drain-tiles, and otherwise assisting him. Some landlords have shown themselves willing to do so, on the tenant being at the expense of laying them; in other instances the whole expense is incurred by the landlord, he charging the tenant a reasonable percentage on the capital expended.

The South-eastern, or Clay District.

Mr. Lowe has divided this district into,—“1st, the clays north of the Trent, consisting of the North and South Clay Divisions (of the hundred of Bassetlaw), and part of the hundred of Thurgarton; 2ndly, those south of the Trent, comprehending the Vale of Belvoir and the Notts Wolds.”

In speaking of the clays north of the Trent, he says, “I must observe that the clays north of the Trent are in general not of so tenacious a nature as in many counties, being much more friable from containing a portion of sand, and falling more readily by the weather; particularly the red clay, of which there is a great deal in the country round Tuxford and in the hundred of Thurgarton, which might be more properly called a clayey loam, and a blackish clay soil commonly called a woodland soil, in which there is plainly a mixture of sand.”

Mr. Lowe then remarks, “there is a great intermixture of open fields and inclosed townships;” and he shows, in his Appendix, that north of the Trent, at the time he wrote, the proportion of townships was as 31 unenclosed to 21 enclosed: of the 31 then unenclosed, there are now not more than 3 or 4 open, and these will doubtless, by inclosure, soon be assimilated to the rest.

Of the mode of cultivation then adopted, Mr. Lowe remarks, “In the open field the common course of husbandry is,—

1st. Fallow.

2nd. Wheat or barley.

3rd. Beans, peas, or both mixed.

The latter crop is very common in this county; the reason given for it is its smothering the weeds; but I have always observed the crops to be very foul.”

It is almost unnecessary to state that, since inclosures have become general, which has been effected gradually, the above

limited and imperfect course of cropping has been abandoned for one more extended—one which, at the same time that it gives greater change to the soil, secures also to the occupier a more reasonable prospect of farming with advantage to himself.

The system of cropping in the clays, now more generally adopted than any other, is the following:—

1st year, fallow.

2nd year, barley or wheat.

3rd year, red clover or grass-seeds.

4th year, wheat.

5th year, beans.

6th year, wheat, or occasionally oats.

So many, however, are the modes of different individuals in this district, arising from the various sizes of their farms, the different character of the soils upon them, not less than through the variety of condition in which they are at the present day, from some having been drained and others still wanting that necessary preliminary to good farming on the generality of strong soils, with many other differences, that it is impossible to point out any one particular system of which it may be said, at least in the northern part of the county, “this is the general practice.” To omit altogether the *modus operandi* of the farming in this district would be to leave imperfect an attempt to communicate all necessary information; it is however proposed to treat of mere operations more briefly than has been done in the foregoing part of this Essay. Besides, as many of the details there alluded to are the same in practice throughout the county, irrespective of the character of the soil, it will be less incumbent on us to repeat them.

The ploughing of some of the heavy orders on the strong soils is still performed by *single* ploughs; by which it is to be understood that the horses walk in a line down the furrow, the team mostly consisting of three or four horses, which require a driver in addition to the ploughman. It is more than doubtful whether in all cases these soils, in their present defective state of drainage, could be sufficiently deep ploughed by two horses abreast. One thing, however, is clear, that where four horses are necessary they would act far more advantageously, as regards draught, by harnessing them in pairs abreast. We are aware that it will be answered, that, by so doing, the land would suffer more from the treading of the horses; but we still think that, in many cases, a great advantage would be gained from the horses being nearer to their work. The lighter orders are now more frequently ploughed by two horses abreast, attached to a common swing-plough, for the wheel-plough is but little used in this county, except perhaps on the borders of Leicestershire.

First year, Fallows.—As this operation extends over at least

nine months of the year, inclusive of the summer season, when by simply exposing the roots of weeds to the sun they are destroyed, it is in most cases a mere succession of ploughings, consisting usually of five. Where the land is liable to the growth of quitch-grass, the working it with light and heavy harrows is of little service; it requires the more effectual operation of being forked.

Second year, Barley or Wheat.—Although wheat is more commonly sown on the fallows than barley, we think the practice objectionable, and shall state our reasons for holding an opinion so directly opposed to the custom of the district. Wheat after fallows is seldom a yielding crop, it is too frequently *lodged* before it is shot fully into ear, and in consequence is more productive of straw than corn. It is, moreover, questionable whether, by the application of farm-yard manure to the fallows, the evil is not increased, as, by so doing, the nutriment of young plants is supplied in quantity greater than necessary, and by such means an exuberant growth is fostered in the early stages of the plant without the soil possessing in itself, or having supplied to it, those properties which might serve as a counter-check.

Mr. Topham, in his ‘Chemistry made Easy,’ has well illustrated this where he observes, “that if wheat be sown upon a soil composed in a great measure of decayed vegetation, the plant will flourish in a most extraordinary manner for a period, and by its luxuriant appearance promise the farmer an abundant return in harvest; and could it but fortunately sustain the exuberance of its germination, no doubt the produce would be equal to his fondest anticipations. But to insure this most desirable result, it is necessary that the stalk should be encased in a cylinder of flint; and if sand is not present, and an alkali to aid in its solution, the plant will bend and fall under the load which its well-gorged organs shall have accumulated, and the cultivator be disappointed of the rich remuneration it promised him.” Such is the opinion of a gentleman who has sought to serve agriculture *scientifically*; let us now turn to one who has done so *practically*, for upwards of thirty years, by cultivating extensively strong soils; and, after so long an experience, has published, for the benefit of others, the results. We allude to an ‘Essay on the Rotation of Crops best suited to Heavy Lands,’ published in 1842, by Mr. Richard Parkinson, of Knapthorpe, near Newark.* This pamphlet, from

* This essay ought to be read by every one concerned in the culture of clay land, for the valuable information it contains. It may be had of J. Whittingham, Mansfield-road, Southwell.

I quite agree in this observation; and, from having lived for several years contiguous to Knapthorpe, can state that the system of clay-farming which Mr. Parkinson has adopted was crowned with the most perfect success.—W. MILES.

its thoroughly practical character, is eminently calculated to serve the purpose for which it was written. On the subject before us the author says, "Wheat should not be sown after summer fallows on enclosed clay-lands; I have found that it is impossible to keep the land in condition and in a profitable course under that system. If the trade in barley was much depressed, and prices low, I would substitute oats occasionally after fallows." We shall leave the reader to draw his own conclusions, whether it may not be highly probable—the results of science and practice being the same—that the cases may be analogous throughout, and traced up to one cause: if so, it will go far to establish the principle we have laid down.

As the practice of sowing wheat upon fallows is very general in the north and south clays, and failure and disappointment in point of yield often attend it, we have been induced thus to allude to the subject in the hope of leading those more immediately interested to trace the effect up to the true cause, and to apply or not a remedy as they may deem it better or worse than the disease.

When wheat is sown upon fallows, 9 pecks to the acre is sufficient, if drilled; but if sown by the hand, 1 or 2 pecks in addition may be necessary. If barley is substituted, 12 pecks will be found enough when drilled, although 14 are oftener sown by hand.

Third year, Clover.—For the respective quantities of seed-clover necessary, red or white, *vide supra*. The red clover will be liable to fail if sown oftener than every alternate course, or once in twelve or thirteen years, according as the white clover remains down one or two years.

Red clover is mostly mown for fodder for the horses, and the after crop is used for soiling them during the summer and autumn, or allowed to remain for seed, in which case it ought to be mown the first time as early as practicable, so as to allow the seed crop an opportunity to ripen early. The Italian rye-grass is grown by some with great success in this district, and forms, in case of failure of the red clover crop, a most valuable substitute from the abundant produce it generally yields.

Fourth year, Wheat.—The practice of ploughing and pressing the clover-ley for wheat is common in the loams of the southern part of the county, where it succeeds well; but, on the strong soils, where wheat is intended to be sown after grass-seeds, it will amply repay the extra trouble of breaking up the ley during the summer, or as early in the autumn as it can be done, working it to a fine mould, and afterwards ploughing and drilling in the wheat.

The roots of the wheat-plant can thus extend themselves more freely in the more permeable soil, and the slugs and snails being thereby brought to the surface, and becoming a prey to the various birds whose habits lead them to feed upon them, are pre-

vented from doing the serious injury during the winter which they so often effect. Mr. Parkinson, in the Essay to which we have alluded, recommends shallow drilling or sowing by the hand on the common furrow, so as to keep the seed near the surface, as the best preservative against the ravages of the slug or snail.

The wheat, after being hoed in the month of April, is gone over by women, at wages from 9d. to 10d. a-day, who take out any weeds which may remain after the hoeing.

The harvesting of the crop is performed similarly to that of the sand-district, as already described, the scythe having almost entirely superseded the sickle.

Fifth year, Beans.—No crop cultivated in this country offers so great a difference as regards value at the time of harvest as this does. Those who still persist in sowing, every third year, beans and peas without the aid of manure, and then leave them to their fate, without either hoeing or cleaning, till they are reaped, receive back in many instances little more than seed again. But such have been the frequent failures in this crop on the clays, that other crops, such as peas or winter tares, have been of late substituted; and, by affording a change to the land, have also been more remunerative to the grower. The most common practice is to dibble about 3 bushels of beans an acre on a common furrow, which has been exposed to the frosts previously. With this method the hand-hoe only can be made use of; but we think a superior mode is that recommended by Mr. Parkinson, which we cannot do better than give in his own words:—"The land is ploughed into ridges 20 inches apart, in November or December, in the same manner as for turnips, being previously manured with seven or eight two-horse cart-loads per acre. The beans are sown as early in the spring as the land is dry enough, in the following manner. A single-horse plough opens a level furrow in the frosted mould of the hollows between each ridge; this is followed by a man with a drill-barrow, which deposits about 3 bushels of seed per acre. The harrows are then taken two or three times over the land, and once across. It may be necessary in some seasons to go over the land once with a powerful harrow after the beans are sown, to break up the middle of the ridges. The land by this mode is left remarkably light, and in fine order for hoeing in the spring and summer. It retains its lightness in a considerable degree until the autumn, which much facilitates the putting in the ensuing crop of wheat, especially in dry weather. The beans are hoed by hand when about 2 inches high, and the land afterwards receives one deep order with the horsehoe; another hoeing by hand, at least, is always necessary during the summer to cut up the charlock and thistles."

Mr. Watson, of Walkeringham, has grown beans with great

success, by opening drills in a similar manner, but at a greater distance—even as wide as 36 inches between the drills; but that is on a deep loam of very good soil at Beckingham, where he has grown upwards of 60 bushels an acre. We have heard him express an opinion that a frequent cause of failure in this crop arises from sowing too much seed, and thereby preventing the free access of sun and air to the plants, which is necessary to their successful growth and after-productiveness. During the two last years he has, previously to the last hoeing which the beans received, sown about 2 lbs. of white turnip-seed to the acre, which by the hoeing receives a cover, and thus two crops are growing on the same ground simultaneously until the beans are reaped. This double crop has so far proved satisfactory, and the practice will no doubt obtain notice from others in the neighbourhood. The land upon which the experiment has been made is a strong but deep clay, in high condition; and has been furrow-drained and subsoil-ploughed. The Uley cultivator can now be used on the farm to great advantage in the driest season, in preparing the stubbles for wheat; when, perhaps, some of the adjoining occupiers are obliged to content themselves with remaining patient spectators.

Sixth year, Wheat.—The usual preparation for this crop is to plough the land with a thin furrow as soon after the removal of the beans as it can be done. The harrows are then put upon the land, and it is worked to a fine mould; it is then allowed to lie some time to encourage the growth of weeds, so that they may be destroyed by the following ploughing, which forms the seed-furrow, on which the seed is sown by the hand, or upon which it is drilled. Where the cultivator can be used in the first instance, one ploughing is sufficient. The quantity of seed sown upon bean-stubbles is 10 or 11 pecks an acre. In other respects the crop is managed as described under the head of wheat in the fourth year.

It has been observed that oats are occasionally substituted in this year for wheat; the low price of horse-corn has, however, of late years made the practice comparatively rare.

Instead of the six years' course described here, some prefer (particularly in the north clays) a four years' course: viz.—

- 1st year, fallows.
- 2nd year, barley or wheat.
- 3rd year, clover.
- 4th year, wheat.

To which the foregoing remarks made on the four first years of the six years' course apply. When this course is adopted, the clover in the third year is exchanged in every alternate course for beans, beans and peas, or sometimes vetches.

It is almost superfluous to observe that the advantage proposed in this shorter course arises from the fallows recurring oftener, so that the land is easier kept clean.

The farms throughout the county are held in general by tenants-at-will; and we are not aware of any desire amongst the occupiers, as a class, to exchange such tenures for leases.

Our reason for offering this opinion is, that confidence so generally exists between landlord and tenant, and especially so between the large landowners and their tenantry, in whose hands the principal part of the land in the county is, as to make the tenantry satisfied with the matter as it stands; for as, on the one hand, they may be exposed to a disadvantage through the caprice of their landlord; so, on the other, they cannot but be aware that, in these changeful times, when prices are constantly lowering, they have an advantage in being able to relinquish their farms at their own discretion. This advantage would, in our opinion, be strengthened by the more general adoption of a practice which now prevails in but very few instances—viz., that of the corn-rent.

The size of the farms is on the average much smaller in the clay-district than in the sands, which is a great disadvantage, as we conceive, and one calculated to operate against an improved cultivation. The most common size is from 70 to 150 acres, containing in most cases a portion of permanent grass-land, which, it may be easily perceived, tends to prevent the occupiers of such farms from pasturing much of the arable land with sheep, as might be done if the farms were larger. They are driven of necessity, in order to make their rent and provide subsistence for a family, to keep an undue proportion of their land in corn, which has the effect of impoverishing their farms, not less than themselves. Household and many other expenses, moreover, press more heavily, in comparison, on small than on large farms. In making these remarks we would by no means be understood to argue in favour of farms of such magnitude as are held in some counties: at the same time we are convinced by observation that the instances are few where men, as capitalists, succeed on farms of less than 300 acres; and few farm really well more than 500 acres: but where capital is plentiful, farms of about the latter size seem most desirable; and this we know to be the opinion of such occupiers as are of considerable intelligence, in counties where the largest farms are frequently held.

On the subject of drainage, which will in this district demand attention, Mr. Lowe, in his Report, is very brief; neither, perhaps, ought we to feel surprise when we consider that half a century has elapsed since he wrote. It is not a subject, we presume, on which he would at that time have much opportunity of giving information. Of draining by tiles he makes no mention whatever.

Of late years efforts have been made in this way by individuals which have been attended with the most complete success, which it is our intention to describe. In many instances, however, the work has been performed by those who did not understand the first principles of the art, and who have in consequence failed to give satisfaction to their employers, the work when done being found incomplete.

We allude in particular to various attempts that have been made to overstrain Elkington's principle of deep-draining, the object of which was more especially the interception of spring-water and the conveying it away before it had occasioned injury to the land lying below. To effect by the same means the removal of surface-water is where those individuals have erred: the latter can only be done, where the evil is in a soil of an adhesive nature, by making a sufficient number of surface-drains in addition to deep drains for the removal of the spring-water. We will exemplify, by reference to an individual case, what we consider the only efficient means of draining strong land, and which we do with the greater confidence from our knowledge of the results having proved highly satisfactory. The instance we allude to is upon the farm of Mr. Parkinson, of Leyfields, where may be seen the principles of drainage carried out to the greatest perfection. As it is a subject of paramount importance, we shall attempt in a few words to show what his system has been; at the same time remarking on other improvements which have been gone into there. About a year and a half ago we were much gratified by an inspection of every part of the farm; and the conclusion we then came to was, that taking into consideration the difficulties that have been overcome, and the success which has been attained, it offered the highest example of first-rate farming we had ever seen; an opinion which remains to the present time unchanged.

The soil varies from a heavy sand to a strong loam; the whole lying on a substratum of cold clay. The spring-water has been drawn off by deep drains, some of which are not less than 15 feet in depth, and are in most cases independent of the surface drains. These deep drains are made subservient to furnishing water for the use of the stock upon the whole farm, by conveying it into troughs, all neatly paved around and kept perfectly clean. The drains are formed of large tiles, and overlaid with stones when needful. Those for taking away the surface-water are laid about 24 inches deep, in some places more, and are formed of smaller tiles laid on flat bottoms, where necessary, at distances from 18 to 24 feet apart. The old ridges where requisite are still slightly preserved, the drains in such case being laid down the furrows; otherwise the drains run parallel with the fences.

The fences deserve especial notice. They are of hawthorn, and nearly the whole of them have been replanted by Mr. Parkinson, and have grown up under his eye. They are of splendid growth, and form an invaluable shelter to his short-horn beasts, being allowed to rise for that purpose on the grass-land. When they are cut it is in the Scotch mode, which is becoming general throughout the northern part of the county. This work is performed by very sharp knives made expressly for the purpose, light to hand, but very effective from their high temper. The stems are cut from the ground obliquely, and care is taken that they are all cut upwards, so as not to shatter the top of the stems which are left. If a brush is left on the further side no other guard is necessary; but on the side from which the operation is performed, when there are cattle, it is necessary to guard it by a dead fence for about two years. The grass and weeds are at the same time cleared from the roots of the stems, and a perfectly new fence springs up, which is thick from the bottom, making shoots in a single year of surprising growth.

The course of cropping followed is similar to the one already described as common throughout the district, but with one very material improvement; namely, that instead of a bare fallow very heavy crops of turnips are grown on the whole farm. These are produced, without any artificial manure, in the following manner:—During the winter months, men are employed in burning the soil from the hedge sides into ashes; these are mixed with night-soil dried until it will admit of being riddled, so that it can be drilled as a compost. The seed is thereby quickened into vegetation, and plants are obtained which soon bid defiance to the fly. The heaviest crops of swedes are thus grown, which could never have had an existence but for a perfect drainage.

The stock kept on the farm has been increased more than five-fold, and the produce of grain has advanced in the same ratio. It is almost unnecessary to observe that the manure is here an object of especial care. The liquid manure, when such is practicable, is conveyed by drains to the nearest grass-land lying on a lower level, and by zigzag cuttings serves to irrigate and enrich it. When that cannot be done, it drains into tanks, and is carted upon the higher grass-land, which has been thereby converted into grazing-land of the best quality, whereas it is by nature a poor, cold soil.

Such are a few of the improvements, very imperfectly sketched, which have been carried out at Leyfields by Mr. Parkinson, a gentleman of great experience and of no ordinary enterprise. These improvements, we may observe in conclusion, are being repeated by him on an estate which he purchased lately at Drayton; from which circumstance we think it fair to infer that that

gentleman, after his long experience, supposes high farming not to be incompatible with profitable farming.

In this division the district south of the Trent is composed of a variety of soils,—from heavy sand to a rich loam, and even strong clay. From Nottingham to Newark the high ground is chiefly a red soil, between sand and loam, lying upon a substratum of marl, and comprising one of the most naturally productive districts in the county. It is well calculated for sheep, and some excellent flocks may be seen upon it. These farms are many of them much improved by abutting on the Trent, which furnishes to them a proportion of good grazing-land as well as meadow; the former of which is made available in some cases for dairy purposes, and in others for grazing beasts for the Newark and Nottingham fat stock markets. The mode of husbandry most common is the six years' course, resembling that north of the Trent; substituting, however, always when practicable, a turnip crop for a bare fallow. Much of the district has been drained with tiles, and is on the whole very well cultivated, producing heavier crops at much less expense than on the sands of the western division. A stranger must be struck with the superior character of the farm buildings, which are, moreover, kept in extremely good condition, presenting a neatness in the highest degree creditable to the occupiers. The fences are not always so well kept, and might be improved upon. In the neighbourhood of Nottingham, potatoes are planted in considerable breadth, as a supply for that market, and most excellent crops are obtained.

Adjoining the county of Leicester the soil assumes a more tenacious nature, and comprises the districts distinguished by Mr. Lowe as the "Vale of Belvoir" and the "Nottinghamshire Wolds."

Improvements have been here, as in other parts of the county, effected to a considerable extent during the last half century. Not only have the enclosures, which were then open, been completed, but drainage has made great advances, although it is by no means, as yet, perfect. When a thorough drainage is wanting no course of cropping can be suggested which is not liable in adverse seasons to be frustrated. Whatever mode of husbandry may be proposed by the occupier of strong soils, experience has taught him, that where that foundation of all good farming has not been laid, he must in consequence yield to circumstances of which otherwise he would in the main be independent. Experience will better teach him than any covenant by which he might be bound that the growing of two white corn crops in succession is not profitable, that he cannot by such a system keep his farm clean or in good condition. He will therefore, in alternate years,

substitute leguminous ones ; and the low prices with which he has now to contend will impel him to strain every nerve in protracting as long as possible the period between those years of naked and profitless fallows.

The live stock throughout the whole of the South Eastern Division has undergone a similar improvement to that described in the western. As, however, in the latter district sheep are the prevailing stock, so may, perhaps, be said to be in the former, from the heavier character of the soil in general, and the larger proportion of permanent grass-land.

The repeated supplies of the improved Durham breed, which have been crossed again by the best short-horn bulls, have raised the cattle to a standard of great excellence.

We have already had occasion to notice the superior flocks of pure Leicester sheep, which had gained for themselves a name when Mr. Lowe wrote of this district, and which we have every reason for supposing is in point of merit progressing ; as a general remark, decidedly so.

The necessity of a quick return, through an improved breed both of beasts and sheep, has forced itself on the attention of farmers in general ; and the correctness of our remarks may be best ascertained by referring to the general appearance of the fat stock brought into Newark and Nottingham markets, which will bear comparison with any in the kingdom.

Artificial Manures.

Bones may be considered after farm-yard manure to stand next in estimation for light soils, and on them the farmer chiefly relies. They are used principally for the turnip crop, in quantity from 12 to 20 bushels an acre. They are mixed generally with a proportion of rape-cake or guano, and are found far more efficacious when their latent properties are thus stimulated.

Rape-cake is also used for the turnip crop to a great extent, as well as for wheat, in quantity from 5 to 7 cwt. to the acre. It is, when applied for wheat, mostly sown by the hand on the pressed furrow, and harrowed in at the same time with the seed. Some prefer to apply it in the spring as a top-dressing, and hold the opinion that a less quantity laid on then is equal to a greater applied in the previous autumn.

Shoddy has been much in demand for some years past, and has proved itself a most valuable manure. For the information of those who may not be acquainted with it, we may observe that it is the waste from woollen cloth mills, which is saturated with an oily matter, and is more lasting in its effects than most artificial manures. In price it varies according to quality from 40s. to 45s. a ton. It is used both for turnips and wheat. Not

less than a ton an acre should be applied, as it is difficult to separate, and consequently to spread equally over the land. Its virtues are not exhausted in less than two, or even three years, from its decomposing slowly.

Guano was used very generally last year for the turnip crop, in small quantities, by way of experiment; but the summer being very dry it failed: if another trial were made we cannot say precisely what the result would be. It is unquestionably a powerful manure when pure, but we fear is very liable to be adulterated. The African has been chiefly used in these districts. Another year's trial will go far to determine its value, and fix its future price.

Nitrate of soda was used some years ago, but from its discontinuance we presume that the popularity which at one time it was likely to acquire is on the wane, if its fate be not already sealed.

Soot is much liked as a top-dressing for wheat in the spring, applied at the rate of 5 quarters an acre; it may be bought at Sheffield for 2s. 6d. a quarter, forming a cheap and very remunerative manure.

On the true value of lime as a manure opinion is not so unanimous as would appear desirable. By some good farmers it is regarded as essentially necessary; whilst by others of equal spirit and enterprise it is altogether neglected.

The aid of science is wanted to ascertain the relative value of lime brought from various quarries in Yorkshire and Derbyshire—both of which kinds are in common use in these districts. The Yorkshire lime brought from Brotherton and Knottingley was held by Mr. Lucas, at the late meeting of the "British Association for the Advancement of Science" at York, to be next in value to the mountain limestone of that county, from its containing the next largest amount, namely, $93\frac{1}{2}$ per cent., of carbonate of lime, and comparatively little of the carbonate of magnesia. Of this lime, as much as 120 or 150 bushels an acre is often applied at a dressing, and even more, and it is found to answer well; whilst of some of the Derbyshire lime also in general use, not more than 60 or 70 bushels can be applied without positive injury being sustained for years afterwards.

It is necessary to observe, that the Derbyshire lime here alluded to is not the mountain limestone of that county, which is equally valuable to the farmer with the mountain limestone of Yorkshire, and most valuable for agricultural purposes, being said to contain $98\frac{1}{2}$ per cent. of pure carbonate of lime; but it is a limestone highly impregnated with magnesia, and identical with the magnesian lime of Yorkshire, which is said to contain of carbonate of lime only $62\frac{1}{2}$ per cent., and of carbonate of magnesia $36\frac{1}{2}$ per

cent.; and by Mr. Lucas' statement, therefore, of proportionately less value.

An idea exists in the minds of many practical men, which we think an erroneous one; that if two tons an acre of the said Derbyshire magnesian lime be applied, as good a purpose will be answered as if four tons from Knottingley be used, but that it is dangerous, indeed highly prejudicial to the land to put on more than two tons at one dressing.

There must surely be a great mistake in this, for if carbonate of lime be the valuable constituent, and carbonate of magnesia a baneful one, a very different conclusion must be come to. Let us see how the relative proportions of these in the two dressings stand as they are mostly applied. The four tons of Knottingley lime will contain of valuable matter at $93\frac{1}{2}$ per cent. each, 374 parts, whilst the two tons of Derbyshire will contain at $62\frac{1}{2}$ per cent. only 125 parts, or nearly two-thirds less; whilst of baneful matter the Knottingley will have but 24 parts at 6 per cent. per ton, and the Derbyshire at $36\frac{3}{4}$ per cent. $73\frac{1}{2}$, or two-thirds more: a reason sufficient to account for the injurious effects which are visible after a heavy dressing of the latter, and one which is worthy the attention of those who are interested.

It has been replied by those who favour the use of the Derbyshire lime, that the advantage to be derived from any lime, as a manure, consists in its acting as a solvent rather than in its fructifying property; and that if a smaller quantity of magnesian lime contain the requisite amount of such solvent quality, it is needless to go to greater expense in the purchase of lime of another kind. But this reply does not explain the fact of so small an increased quantity of the magnesian lime producing effects decidedly injurious, and such as cannot result from a solvent in whatever quantity applied; whereas by the principle held by Mr. Lucas, they are fully accounted for: and it appears from statements made by him to be established that the true value of any lime consists in the comparatively large amount it contains of carbonate of lime in proportion to that of carbonate of magnesia, and that the more of the latter constituent is possessed by such lime, the less valuable it will be to the farmer.

Implements.

Every farmer now has his own thrashing-machine either fixed or portable, or he hires one by the day, and the bulk of the corn is so thrashed. Experience has taught him that he can not only thrash out his grain by machinery at less expense than by the flail, but that the condition of the grain is thereby better preserved, whilst the saving leaves him a surplus fund to spend on other necessary work of his farm. Where there is a fixed ma-

chine, as on most of the large farms, a provision is made for cutting chaff, by a strap attached to the thrashing-machine, when required, which effects a great saving in labour.

It has been noticed that the common swing plough is in general use, and it is doubtful whether a better could be substituted, at least on the light soils, where the ploughing is, as a whole, admirably performed. On the heavy soils, perhaps, at certain seasons when the land becomes very dry and hard, some of the improved wheel ploughs might be brought with advantage into further use, from the greater power they possess.

"Ducie's drag," or the "Uley cultivator," and various others made in the different localities, are generally employed, especially on the light soils. The harrows have mostly the frame of wood; some few, however, are of iron. Whichever kind may be used, they are found more efficient on strong land when coupled together; but on working out the quitch on the light soils are better separate.

Horse-hoes are used of various kinds adapted to the soil. The Scotch is among the best for heavy land, the shares of which act on the same principle as those of the cultivator. The advantage they have over the common horse-hoe consists in going deeper, and bringing, by the forward inclination of the shares, the weeds effectually to the surface. They are, however, heavier than necessary for light land, where slighter ones are more convenient.

For sowing turnips on ridges the Northumberland drill is by far the most common, doing a single ridge at a time, with a separate box for artificial manures, which are deposited by a separate spout below the seed, so as to occasion no injury to it. The corn-drills are on the same principle as the large Suffolk drill, capable of drilling with great nicety 10 or 15 statute acres a-day; and, by introducing a change of cups, will deposit seed of every size from the turnip to the bean.

Crosskill's clod-crusher is an invaluable implement for strong land, but too expensive for farmers in general to purchase. A public one in each parish might answer every necessary purpose, and would cost but a trifle to each individual. It has been found of great service on clover-ley wheat in the spring when threatened with the grub. Where, however, the land is very light, it should be previously rolled with a common light roller, otherwise there is danger of the wheat being carried away by the indentations of the implement.

Heavy metal and stone rollers of the common kind are also in use for wheat in the spring on the sands, but they are inferior to Crosskill's, being more uncertain and unequal in their pressure.

An excellent implement has lately been introduced from Yorkshire for raking barley. It consists of moveable teeth placed

about three inches apart, which rise or fall with the inequalities of the ground. It is drawn by a horse, and can be emptied of its contents, without any interruption to the work, by a crank which raises the whole of the teeth at the same time, and so allows the contents to fall.

Waggons and carts are both in general use throughout the county. Some, nevertheless, who have tried the one-horse cart exclusively approve of it, as containing every requisite, and are prepared to cast aside, in consequence, their other carriages. We feel convinced that experience will disabuse the minds of many of the notion that one-horse carts are of themselves insufficient for every purpose upon the farm; and had not the Royal Agricultural Society offered a prize for the best essay on their advantages, which will therefore render unnecessary any remarks of ours, we should proceed to give our reasons, founded on experience, for thus recommending them in preference to any other kind of carriage, not only under particular circumstances, but under all ordinary circumstances in which they are required.

Allotments to Cottagers.

Much has been said of late years both for and against the expediency of allotting land to the poor. As we cannot but consider it a question calculated materially to affect the comfort of that class for whose benefit the allotments have been in most cases granted, we have made it a subject of inquiry in different parts of the county, as far as our means would admit, and the result of such inquiry has been decidedly in favour of the system. We cannot but regard it as one adapted not only to improve the condition of the poor themselves, but also, by a diminution of pauperism, to relieve the classes above them, who contribute chiefly to their support; nor does it, as has been asserted, render the labourer careless of or indifferent to his employer.

If there be, in a highly refined and luxurious country like our own, one sight more painful than another, it is to see the honest labourer asking from door to door "for leave to toil," that he may thereby get bread, but asking in vain. And why does he ask in vain? Is it because he asks of men not capable of feeling for their fellows? We answer, No; but too often because he who would willingly be the employer is in as hard straits as he who craves to be the employed. This is no imaginary case, but an undeniable fact, the constant recurrence of which, under our own eyes, has induced us to allude to it. Can we wonder at men, born with the feelings of Englishmen, thus disappointed, turning droopingly and despondingly away, inwardly feeling that "no man careth for them," and that our very cattle are regarded more than they? Surely this is not a question to be viewed merely

through the eye of the political economist, but one which addresses itself to our best feelings as men, and to effect a remedy for which demands our best energies.

Let us therefore seek to show the poor and honest man that he is cared for, and that his interests and happiness are identical with our own; and seek, before it be too late, to raise his broken spirit and dejected mien—to restore to him that feeling of independence which results from his respecting himself, and is the cause of his being respected by others. As a means to so desirable an end, let him have something in which to interest himself, and in the success of which he is directly concerned; and nothing offers so rational an object of his care as his own small holding of land.

We do not propose to enter into the minutiae of the question, as to what is the most desirable quantity for each individual to hold, or what the proper amount of rental, with many other details which experience alone can determine; but shall content ourselves with referring to the humane and truly noble example which has been offered to the imitation of the landowners of Nottinghamshire by his Grace the Duke of Newcastle. We know from his Grace's agent, Mr. Wilmot, that after long experience of the system as tried by him the result has proved most satisfactory; that a tenant holding an allotment under his Grace is scarcely ever in arrear with his rent; that, ~~on the contrary~~, it is paid most punctually, and with an expression of gratitude as for a favour received—a benefit conferred; and when it is stated that the Duke of Newcastle has let off upon his estates about 2000 gardens, it will be admitted that an opinion from Mr. Wilmot has more than ordinary weight.

The rate of wages in this county is higher than the average throughout the country. Even with the present depressed prices, we believe that 2*s.* per day is more generally given than anything lower; and when the price of produce will admit, it is raised to 2*s.* 3*d.* a-day. When the work is task-work, the labourer will frequently make 2*s.* 6*d.* or 3*s.* a-day during the summer months. Where men have constant employment with such wages, they may be considered as well enough off; but it is the absence in some parts of the county, and particularly so in the clay districts during the winter months, of constant employment which occasions the evil complained of, in the hope of mitigating which the foregoing remarks have been introduced.

Water-Meadows.

Amongst the most striking improvements which have taken place during the past half-century, the water-meadows of the Duke of Portland claim an especial notice. Mr. Denison, however, having given a most lucid and complete statement of them

in the Society's Journal, part iv., vol. i., for 1840, renders unnecessary our saying more of them here than to mention shortly the leading facts as given by him.

These meadows comprise an area of upwards of 300 acres of land, extending over a distance of about 7 miles in length. They are watered by the river Maun, as it flows eastward from the town of Mansfield. The value of the land has been raised from the annual sum of 80*l.* to that of 3660*l.*, at a cost (from their commencement in 1816 to their completion in 1837) of 40,000*l.* The profit upon each acre, after defraying all expenses, is computed at nearly 12*l.* a-year, without taking into consideration the great benefit they are to the arable land adjoining them, which, in the words of Mr. Denison, they "enrich to an extent of five times that of their own."

Stretching through a dry sandy district for so long a distance, and thus fertilizing increasingly land so dependent on foreign aid, must show at a glance their almost incalculable value. As a triumph of art they must be considered one of the most brilliant and complete of any that is known, reflecting credit equally on the talents of the noble owner as projector, and on the intelligence of Mr. Tebbet as executor of the works; nor are they unworthy of comparison even with those of a Bridgewater and a Brindley.

The Cars.

Allusion has already been made to a district of land situated in the extreme northern part of the county, comprising an area of about 6000 acres of reclaimed bog-land, a small portion of what was formerly designated the "Level of Hatfield Chase," once a vast morass of upwards of 65,000 acres, which extended, in a northerly direction, as far as Hatfield and Thorne in Yorkshire. The first attempt to drain this extensive waste was made by Dutch settlers, of whom the principal was Sir Cornelius Vermuyden, about the middle of the seventeenth century. These enterprising men effected in some measure the object they attempted, for which they received ample compensation by becoming proprietors of a portion, and that not an inconsiderable one, of the land they had reclaimed. The difficulties, however, of effecting a perfect drainage were of no ordinary character, from the largeness of the tract of land, all lying on a dead level; the soil being moreover highly porous—a dark peat of spongy quality; and surrounded on two sides by the rivers Trent and Ouse, which were at that time liable constantly to overflow their banks, and so inundate this vast swamp. The very banks that were raised for its security were of the same trembling bog, and consequently little likely to resist the fearful floods which at that time not unfrequently descended these large rivers.

It is to the 6000 acres which are lying in Nottinghamshire, separated from the far larger part in Lincolnshire and Yorkshire, and which are divided by the river Idle, as it forms for some miles the northern boundary of this county, that we propose to confine our remarks. This part belongs to the several parishes of Misterton, Walkeringham, Gringley-on-the-Hill, Everton, and Scaftworth, which villages form a semicircle of several miles on its southern side, the high ground on which some of them are built resembling headlands on a sea-coast. These vast plains, when seen from the higher grounds, as they stretch for upwards of 20 miles in a northerly direction, without any object to break the monotony of the scene, are very striking; and from the great likeness they bear to the Pontine Marshes, over which the sea once unquestionably flowed, leave an impression that such was their case in ages long gone by. The natural productions of this interesting deposit were high reeds, and flags with edges indented like those of a sickle, amidst gigantic tussac grass, which formed the haunts of various kinds of wild fowl, and where was heard the mournful booming of the bittern, now extinct.

It is less than half a century since this morass was first attempted to be brought into cultivation. At that time it was so absolutely a bog that no horse could in many parts be used for ploughing it, and this operation was performed by manual labour. As the drainage was improved, the land became firmer; and from the abundant crops of rape and oats which it at first produced, gave promise of a fruitfulness quite extraordinary, which was for a time fully realized. This remarkable fertility was moreover increased by a system of paring and burning—an operation of easy accomplishment on a porous soil, but which in the end proved decidedly injurious to the land, by reducing its surface below the drainage then provided for it, although probably the natural compression arising from its being laid dry occasionally was more the cause of that inconvenience than the paring and burning. From whatever cause this might arise, the consequence was the same; and serious apprehensions were for a time entertained lest a considerable part, if not the whole, of this tract of valuable land would be forced out of cultivation through the want of drainage; but at length steam-power was suggested as a remedy, and it has since proved quite successful.

In 1828 a steam-engine was erected of 40-horse power, at a cost of upwards of 6000*l.*, for lifting the water by a wheel. The engine is placed upon the main drain, about three quarters of a mile from the river Trent, into which the drainage of these cars empties itself; but unfortunately, when high tides flowed up that river, there was frequent interruption to the drainage, from the water in the river being higher than that in the drain; and it

would have flowed in upon the cars had not flood-gates prevented it. By placing the engine at some distance from the Trent, a reservoir was then formed in the main drain, within that space flanked by high banks; and so by lifting the water into this reservoir to a higher level than the water of the Trent, it is enabled to fall into that river at all times.

The wheel employed for lifting the water revolves between two stone walls, in a space of about 27 inches wide, through which the whole of the water is driven. The wheel itself is formed of cast-metal sides, with wooden paddles between, placed ingeniously at a certain angle which enables the wheel to lift the water above its own centre: thus a wheel of 33 feet diameter creates an artificial drainage equal to more than its radius of $16\frac{1}{2}$ feet. Flood-gates are again placed immediately before the wheel, to prevent the water coming back on the wheel ceasing to revolve.

About ten years afterwards it was found necessary to erect an additional engine of equal or superior power to the one already in use, before the drainage could be rendered perfect. This was accordingly done on the opposite bank of the drain by the proprietors, at a cost of 5000*l.*: thus the total cost of the two has been little short of 12,000*l.*, besides an annual expenditure of from 3*s.* to 4*s.* an acre for the double purpose of working the engines and cleansing the drains. Absolute command of the water is now effected; and a provision has been made of incalculable value to the occupier of these cars, by introducing, during the summer months, water from the adjoining river Idle, as a supply for the stock. It is kept at any height that is thought advisable by means of stanchions, the regulation of which occupies the time and attention of the engineer during those months when the engines are less frequently required.

In conclusion; the fields in the clays which Mr. Lowe spoke of as then open have in nearly every instance been enclosed, besides which a considerable breadth of forest-land has on the western side been brought into cultivation. Extensive tracts of land still remain waste, as it is doubted whether they are worth the expense of cultivation, being in general a light sand of the worst description; but that they might be usefully and profitably planted there can exist no question, and as they are chiefly in the possession of the large landed proprietors, we may hope that the success which has already attended their efforts in this direction will encourage them in time to complete what they have begun.

Without any wish, on the one hand, to arrogate to the farmers of Notts anything beyond what is their due, it is, on the other hand, our duty, in giving a faithful Report, to award to them all just praise. When the increased productiveness—both in the

quantity of grain grown, as well as of live stock kept—has been doubled, trebled, and in some instances quadrupled, we may fearlessly claim for the occupiers of such districts a position not to be surpassed for spirit and enterprise by any in the United Kingdom; for it must not be lost sight of that they have great difficulties to contend with, arising from physical causes, at least on the western side of the county, in a soil naturally poor, and which is greatly dependent on a sufficient supply of moisture, of which it does not, according to meteorological observations, receive even an average share.

These difficulties have nevertheless been manfully met, and, as far as any exertions could avail, have been as successfully overcome. Whatever the spirited investment of their capital could achieve has been realized; and it is to high farming, in a great measure, that the county owes its present distinguished place amongst its neighbours.

As regards the application of manures these farmers have, as a body of men, by patient observation, practically discovered that which Dr. Liebig has theoretically affirmed to be necessary to ensure success when he asks whether “it be possible, after so many decisive investigations into the origin of the elements of animals and vegetables, the use of the alkalies of lime and the phosphates, any doubt can exist as to the principles upon which a rational agriculture depends? Can the art of agriculture be based upon anything but the restitution of a disturbed equilibrium? Can it be imagined that any country, however rich and fertile, will maintain its fertility without the restoration, in some form of manure, of those elements which have been removed from the soil, and which cannot be replaced by the atmosphere? Must not the same fate await every such country which has actually befallen the once prolific soil of Virginia, now in many parts no longer able to grow its former staple productions—wheat and tobacco?” Let not the farmers of Nottinghamshire, however, suppose that all has been done that can be done, for they may reasonably hope that science will propose further improvements not only in the accommodation of the *kinds* of manures to particular crops, but also in the *quantity* and in the *state* in which they should be applied; in other words, in the supplying most economically and effectually those constituents to the soil which are essential to plants.

But let it be remembered, particularly by the farmers of the clay district, that the fullest advantages of this branch of agriculture cannot result until the injurious superfluities have been abstracted by a thorough drainage.

Bolham Hall, near Retford.

II.—*On the Tenant's Right to unexhausted Improvements, according to the Custom of North Lincolnshire.* By G. M. WILLIAMS, Agent of the Earl of Yarborough.

To Ph. Pusey, Esq., M.P.

DEAR SIR,—Lord Worsley has forwarded to me your note of the 4th, and I have much pleasure in sending you the information you wish for as to the custom of this part of Lincolnshire with regard to tenant-right, &c.

The usual allowances in the north of Lincolnshire to outgoing tenants for unexhausted improvements are as follows:—

Bone-dust.—This is considered to last for three years, and a tenant quitting in the spring of 1845 receives therefore two-thirds of the cost of what he put on in 1844 (one-third being supposed to be exhausted by his turnip crop), and one-third of what he put on in 1843, of which he has had the benefit of the other two-thirds in the crops of that year and of 1844.

Precisely the same principle is adopted in the following improvements, the only difference being the number of years which each is assumed to last, and which are as follows:—

Marl or chalk, 7 years.

Lime, 5 years.

Clay, put on sandy land, 4 years, and on some estates 7 years, which is probably a fairer allowance.

Draining with tiles or stone, when the tenant pays the whole cost, 7 years. This is, however, now a rare case, the usual practice being for the landlord to find the tiles. In this case the tenant has generally no allowance for putting them in if he has had a crop off the land, though he certainly ought to have a proportion of the cost, as it must often happen that the first crop will not pay for the labour of draining. It would probably be right to put this on the same footing as bones.

Draining with sods or thorns, 4 years. This allowance, I believe, is not always made. Indeed this mode of draining is now not much practised.

The tenant is also paid the cost price of the seeds sown the spring previous to quitting, and for the labour of sowing, &c., provided they are not stocked after the 1st of November, and have not been unfairly stocked before.

When seeds are ploughed up for wheat the autumn previous to quitting, he is allowed for herbage until the end of the term; but it is not usual to allow anything on ploughing up clover-stubble for wheat, that being considered the crop which ought to follow clover as a matter of course.

For naked fallow, on strong land, he is allowed for ploughing and all the labour performed, but not for rent or taxes, unless he

paid for them on entry. The cost of seed and labour on corn sown for the incoming tenant is of course always paid by the latter.

The tenant has the right to remove, or can claim to be paid for, any buildings put up by himself on "bay stones," where the buildings do not enter *into* the ground, but he cannot remove a building attached to the freehold, nor even claim an allowance for it except by special agreement. On some estates buildings are allowed for like other improvements on a term of 20 years.

A tenant cannot break up grass-land without permission, nor sell any straw, hay, or manure. He is bound to keep the buildings, fences, gates, and ditches in good repair, and to leave them so.

All these claims and matters are left to be settled by two arbitrators, one to be named by the outgoing tenant, and the other by the landlord or incoming tenant; and if they cannot agree, then by a third party, to be named by the arbitrators before they begin to act.

These customs are all so well established on this estate, that it is quite unnecessary to insert them in the ordinary agreements for farms; and I find on Lord Yarborough's property the simple form of agreement, which I believe you have seen, quite sufficient. They are also pretty generally followed through this part of the county, unless where modified by regular agreements.

In addition to the allowances I have mentioned, a fresh one has just been established on this estate, having become desirable from the increasing importance of its subject. It is an allowance for oil-cake given to stock, which you are aware has a most important effect in improving the quality of the manure, though there is seldom much profit to be made from it on the stock itself. The allowance is based on the assumption that the manure is improved to the extent of half the value of the oil-cake consumed; but, to get a fair average as to both quantity and price, it is made to extend over the last two years, and the allowance is *two-sixths* of the cake used in the last year, and *one-sixth* of that used in the previous one; making together the half of a year's consumption. Oil-cake given to horses is excluded, as I conceive the benefit to their manure would be comparatively trifling, and an allowance for it would tend to make cake supersede the legitimate food of the horses in the last year of a tenancy. Cake given to sheep in the field is also excluded. This decision has been come to after careful consideration and inquiry, partly on the ground that the benefit to the sheep is sufficient to make it worth while to give cake without regard to the manure, and partly from the greater difficulties attending the getting a correct account, and the increased liability to fraud.

The allowance for oil-cake is made only on Lord Yarborough's estate, and one or two other smaller ones, and is therefore a sub-

ject of special agreement, and not a thing that can be claimed by any custom; but I have little doubt that it will become ultimately a usual allowance.

The introduction of new manures, and other improvements, will doubtless make modifications in the existing system of tenant-right necessary from time to time. For instance, should the use of sulphuric acid with bones become general, the present allowance will cease to be correct; or should guano come into general use, an allowance should be made for it. In reply to your inquiry as to the general application of bones to turnips, I beg to inform you that on the wold and heath districts, and other turnip soils, it is certainly the *general* though not the *universal* practice to apply bones; but I am not aware of any case in which tenants are bound by agreement to use them instead of other purchased manures or farm-yard dung. In some cases the latter is used along with bones, and instances are not uncommon of two or more manures being applied together. On Lord Yarborough's estate, and, I believe, through the whole district, tenants are quite at liberty to use any manure for their turnips which they may think best.

I remain, dear Sir,

Your obedient servant,

G. M. WILLIAMS.

Brocklesby Park, Brigg, May 13, 1845.

P.S. You will perhaps notice a little difference in the rule for the allowance for oil-cake as here given from the statement made in the last Number of the Society's Journal, in a note to the article on the Farming of Norfolk. The change was made after I had furnished the information for the article, for the sake of getting a fairer average as to price and quantity.

III.—*On Securing to the Outgoing Tenant a claim in Unexhausted Improvements.* From the LOUGHBOROUGH AGRICULTURAL SOCIETY.

To Ph. Pusey, Esq.

DEAR SIR,—I have pleasure in sending you the suggestions for improved agreements between landlords and tenants, which were unanimously adopted by the Loughborough Agricultural Society, at their quarterly meeting on the 27th of March last.

I take this opportunity of informing you, that the suggestions originated in the committee of that society finding the general state of the agriculture of the midland counties inferior to the

highly-cultivated farms in the counties of Norfolk and Lincolnshire. The committee were led to inquire what causes had produced the great improvements in the agriculture of those counties, and found that in the former leases for 21 years were generally the system under which farms were let, and in the latter liberal agreements for tenant-rights were given, which in each case gives security for the capital of the tenants expended in the various improvements upon their farms when they quit them.

The committee did not think that leases were adapted to this part of the country, the farms being small, and the land of that quality which did not require a great outlay of capital (except in particular instances), and therefore the committee, knowing the high state of cultivation to which many parts of Lincolnshire had been brought, by the adoption of liberal tenant-rights, determined upon recommending these suggestions for improved agreements, as the most likely means of producing corresponding improvements in the midland counties.

I would also add, that the motives which induced the committee to bring forward this important subject for the consideration and adoption of the quarterly meeting, were a sincere desire to benefit the landowners and occupiers, the former by an improved system of cultivation, by which their estates will be greatly increased in value, and the latter by giving them security and a fair and equitable allowance for the various improvements made upon their farms. It is evident, that by adopting this system, there will be a much greater demand for labour, and an increased supply of agricultural produce for the use of the public.

I am, dear Sir, yours very respectfully,

CHARLES STOKES.

1.—No old turf land to be broken up without the consent, in writing, of the landlord or his agent.

2.—No timber to be lopped or cut down without the consent, in writing, of the landlord or his agent.

3.—No tenant ought to be repaid for any buildings erected by him, unless the same shall have been done with the consent, in writing, of the landlord or his agent.

4.—All draining, where it can, ought to be done by the landlord, and five per cent. per annum charged to the tenant; but if the tenant drains the land himself, with the consent and under the superintendence of the landlord or his agent, an allowance for fourteen years shall be made for the materials, carriage, and workmanship:—and if the landlord finds materials, the allowance shall be made to the tenant for seven years only, for carriage and workmanship.

5.—An allowance ought to be made for lime and carriage for five years.

6.—An allowance ought to be made for four years for the cost and carriage of all bought dung and night soil, which may be spread upon the land.

7.—An allowance ought to be made for bones for four years.

8.—For rape dust, one third of the bill after a crop of corn, hay, or clover.

9.—For marling or claying land, an allowance ought to be made for carriage and labour for seven years.

10.—For linseed-oil cake and corn used for feeding cattle or sheep, one-third of the cost ought to be paid for the first year, and one-sixth for the second, where the manure belongs to the landlord.

11.—Where the manure so made from oil cake and corn belongs to the tenant, an extra allowance ought to be made on the value of the manure, in the same proportion as in the foregoing rule.

12.—An allowance ought to be made for turnip fallows; namely, the working, rent, and taxes to be calculated, and the crop of turnips to be valued, and one-half the value of the turnips to be given to the outgoing tenant. Two-thirds of the turnips to be consumed upon light soils.

13.—The above allowances are made on the presumption that all the produce, except corn, meat, wool, and the produce of the dairy, are consumed on the farm; and all allowances are to be made in equal proportions in each year for the period over which they extend, except in the 10th and 11th rule.

14.—Such system of cultivation ought to be adopted as may be most suitable for the quality of the land; and an allowance ought to be made to the landlord if such system be not adopted, and for any dilapidations in the buildings, fences, gates, and drains.

15.—At the termination of each year, the tenant shall give an account to his landlord or his agent of all money expended by him during the previous year, for which he is entitled to claim any allowance on quitting his land.

16.—If the outgoing tenant refuses or neglects to enter into an agreement with his landlord or his agent, on or before the 17th day of October next preceding the termination of his tenancy, then the landlord ought to have the power of entering to sow wheat where the crops do not belong to the tenant, the tenant receiving compensation for herbage and stubbles.

17.—The landlord ought to have the power of entering to plough for and sow spring corn on the second day of February previous to the tenant quitting the farm.

IV.—*An Experimental Inquiry into the Theory of the Action, and the Practical Application, of Bones as a Manure for the Turnip Crop.* By JOHN HANNAM, Hon. Mem. of the New York State Agricul. Soc., author of the ‘Economy of Waste Manures,’ &c. &c. &c.

PRIZE ESSAY.

‘Nothing is more wanted in agriculture than experiments in which all the circumstances are minutely and scientifically detailed. Information collected after views of *distinct inquiry* is necessarily fitted for *inductive reasoning*.’—*Sir Humphry Davy*, lec. i. p. 24.

THE above remarks are as applicable at the present time to the circumstances of agriculture as they were when they were first uttered. It is true that the field of experiment is no longer a *terra incognita*, but that its explorers are now numerous. Its attractions, indeed, have made it fashionable. It is, however equally true that its extent is so unlimited, that it is quite possible to wander in it without discovering any of those hidden mines of instruction which it is known to possess. It is not, therefore, to the casual tourist who wanders without aim and without object, but to the plodder who, with a *fixed purpose in view*, travels with his chart in his hand, that we are to look for such observations as we can depend upon for our future guidance.

For these reasons it is necessary that every experiment should have, as Sir H. Davy has stated, distinct inquiries in view, or, to use the still more pertinent language of Professor Johnston, “should be designed to ask a question of nature.”

Acting upon this impression, the writer, in the present experimental investigations, has not only had an important object in view, but has also endeavoured to ask such questions in such a manner that their answers might be both applicable and trustworthy.

The special object of this inquiry is the *theory of the action* and the *practical application* of bones as a manure for the turnip-crop.

The *importance* of this inquiry needs little illustration. One-third of the whole turnip-crop of England depends upon the action of bones as a manure: and upon the turnip-crop, unquestionably, depends that system of husbandry which has already doubled the amount of beef and mutton, without diminishing the supply of bread and beer, produced in England—the system of alternate cropping. It requires, therefore, but little logic to show that the interest of the farmer individually, and the country at large, is greatly concerned in this subject, and consequently in the matter of our inquiry—the *action* and application of the manure: upon a knowledge of which the proper economy of bones as a fertilizing agent depends.

The necessity for the inquiry is not the less evident. Thus, as regards the theory of the action of the manure, our highest authorities only agree on one point to differ on another; and the part each constituent of the bone plays in the soil is yet a *quæstio verata*.

On the first use of bone-manure it was imagined that its animal oil and gelatine* were the sole fertilizing ingredients it contained. And this was held on the well-grounded fact that such animal matters, if applied alone, have a powerful effect upon vegetation. However true this might be, it did not authorize such a conclusion; and the accidental use of bones which had been so long exposed to the action of the atmosphere that they had lost their animal oil, threw grave doubts upon the theory. At this stage opinion halted. Bones, however, which had lost a portion of their organic matter by combustion, whether arising from natural decomposition or from the application of artificial heat in the various processes of certain manufactures, came gradually into use and favour. In a few years, indeed, the boiled bones of commerce (from which the fat and a large portion of the gelatine had been extracted) were bought in preference to those which still contained the whole of their animal matter. This preference still continues, and has tended to countenance the opposite theory to the one originally held. This theory is that the *inorganic constituents* of bones are the sole manuring substances that have effect upon the crop. As the champion of this theory, Sprengel has instanced the results of his experiments with bones from which the whole of the organic part had been burnt away. These experiments show that the bones had lost in no degree their power of fertilizing. As confirmatory of these trials, experiments made by the writer during the last few years have been instanced,† and so far as regards the fact asserted by Sprengel, that bones burnt, so as to lose their animal matter, act equally well with those which still contain it, these experiments certainly do not contradict, but in a degree confirm it,—the burnt bones in one instance acting better than the fresh ones, and in another worse. At the same time,

* It may be well to observe here that bones may be divided into two parts—an organic part which will burn away, and an inorganic part which will not burn away. The organic part consists of *fat, gelatine, and water*, and the inorganic principally of *phosphate of lime*.

The following may be stated as an average of the proportions of each of these constituents in 100 parts of

Animal matter	{ Oil	:	:	} 20 to 45 parts.
and Water	{ Gelatine	:	:	
Earthy matter	{ Phosphate of lime,	70 to 40 parts.		
	{ Other salts of lime,	} 10 to 15 parts.		
	{ magnesia, &c.			

† By Mr. Pusey. Royal Agr. Journal, vol. iv. p. 408.

however we may grant the facts, we may still doubt the inductive reasoning on which this theory of Sprengel's is founded; and, consequently, on more occasions than one I have endeavoured to show that the conclusion thus come to cannot legitimately be drawn from such premises.* To the details of the objections which have been taken to the theory in question, it is not necessary now to revert. With the same data in view Professor Johnston has come to a very different conclusion. His theory is that "the whole effect of bones cannot in any case be ascribed exclusively either to one or the other of their principal constituents; and that the organic part performs the most *prominently* and most immediately useful office; but that the earthy part nevertheless affords a ready supply of certain inorganic kinds of food which in many soils the plants would not otherwise easily obtain." This conclusion the Professor places in opposition to Sprengel's, on the ground that the organic part of bone is analogous to horn, hair, wool, &c., valuable fertilizers; that if applied alone, it is known to be a potent fertilizer; that, in fact, the liquid in which bones are boiled in Cheshire and Lancashire, even after the fat has been skimmed off, and when the size (or dissolved gelatine) has become so weak that it will not answer for stiffening, is readily bought up as a manure; and that large bones put about the roots of vines and trees will promote their growth, and yet after the lapse of years these same bones may be dug up nearly unaltered in form or in size—the most striking change being a large loss of organic matter, while the relative proportions of the phosphate and carbonate of lime remain comparatively unaltered.

These facts, it is true, are quite sufficient to disprove the truth of the theory that the inorganic part is the sole fertilizer in bones; or even that the animal matter is insignificant; at the same time, however, I cannot see that it establishes Professor Johnston's own position—that the animal matter is the main and most immediately beneficial agent. Though we demolish Sprengel's edifice, we cannot destroy the materials of which it is built. Thus we have still before us the fact that 60 per cent. of inorganic matter equals in some cases, and surpasses in others, 60 parts of the same inorganic matter when combined with 40 of animal matter: and this, it may as justly be asserted, proves that the animal matter is little worth, as the cases cited by Professor Johnston prove that it is most "*prominently*" valuable. This, it may be said, is an anomalous position. We have facts which prove the very opposite conclusions. The anomaly is, however, more apparent than real. It is not the facts to which we should object, but to the use which has been made of them. Thus, the evidence given by Professor Johnston only shows that the animal

* Vide Royal Agr. Journal, vol. v.

matter of bone is a fertilizer, and not that it has the chief and first effect; for it is very well known in practice that 20 stones of horse-hair or other animal matter (which at 40 per cent. is about the weight of the organic part of 16 bushels of bones) applied to the soil under the most favourable circumstances will not have anything like the effect that an ordinary dressing of burnt bones has. The principal effect must, therefore, arise from the action of the earthy part. On the other hand the evidence which we have of the nearly equal effect arising from burnt and unburnt bones does not prove, as Sprengel holds, that the 40 per cent. animal matter which bones contain is of little or no value (a conclusion which the practical use of the oil, &c. alone would falsify), but that the earthy part acts *more readily* and efficiently when separated from the animal matter. In the case alluded to, therefore, we may conclude that all the 60 parts of phosphates, &c. come into full action when burnt bones are used, and that when fresh bones are employed the 40 parts of animal matter first exercise their influence, and then *a portion* of the phosphates; in which case it is easy to account for the equal results arising from the two applications, without asserting, what every day facts disprove, that the organic part is worthless; the *fact* being that the union of the animal oil with the earthy elements prevents the operation of the latter in as great a degree, in cases where *those earthy matters are required*, as the oil itself does good. This theory, then, which the writer has already advocated, is in consonance with all the facts which have been elicited by his own investigations, or by the advocates of other theories, and reconciles what has too often been set forth as the groundworks of opposite conclusions.

Thus, on the data produced by the supporters of the theories already discussed, it is clearly shown, on the one side, that the animal part, and on the other that the earthy portion, of the manure is of value; both, therefore, may undoubtedly be considered fertilizers.

Again, it is also shown that in ordinary cases the animal part disappears before the earthy can act, and hence, in such cases, it must be considered to have the *first* effect upon the crop; it has, however, also been proved that, in cases where this matter was removed, as in burnt bones, or even boiled ones, when water was absorbed, the effects of the earthy portion were equally immediate and potent throughout. It may, therefore, be as safely concluded that the earthy part is only secondary in its immediate action when prevented by the manner in which it is applied from being accessible to the young plant. The facts that bones which have been buried are found to lose their animal oil first (*vide* Analysis, Johnston's Lectures, p. 657)—that boiled and burnt bones are

found to *begin* their action more immediately than the unburnt—that oil prevents the access of the water and organic acids in the soil from acting upon the earthy portion of the bone—and that finely pulverized bones are more immediate in their influence than bones imperfectly ground, are incontrovertible proofs that it is owing to their union with the animal oil that the phosphates and other earthy constituents of bone can ever be said to be secondary in their influence upon the crop. It is true, indeed, as Professor Johnston states, that there may be soils that do *not require* this earthy part of the bone; so far, however, turnips have very generally exhibited a decided liking for such food upon most soils. It is, however (allowing the position assumed to be correct), equally probable that other soils may require no further supply of the organic food which is given in the animal matter of the bones.

In the next place, as to the relative value of the organic and inorganic matters, it is shown by the foregoing arguments that the animal part can only be the most valuable when the other cannot act, but that the latter is really and intrinsically the main fertilizer. No other proofs need be recapitulated, but the one well known, that the earthy constituents of 16 bushels of bones have a much greater effect than the same weight of *any animal oil* and gelatine. The general preference awarded by turnip-growers to dry bones, and the trials alluded to, in which burnt bones containing 60 parts of inorganic matter have shown themselves equal to fresh bones containing the same 60 parts of inorganic matter (in an unfavourable state for action), with 40 parts of organic food also, are further illustrations that the earthy part of the bone, if properly applied, is equal in amount of effect to *all* the animal matter and *some* of the earthy (for when fresh bones are applied plants obtain some portion of the earthy matter), consequently it must be the *more valuable* constituent.

This, then, is the theory of the action of the manure which the facts already brought to bear on the subject, in the writer's opinion, sanction. In a case, however, where so much difference of opinion exists, and especially upon a question of such importance to practical agriculture, fresh facts cannot, as we asserted, but be valuable in order to enable us to agree in those first principles which, it is evident, are yet matters of doubt and dispute.

The necessity for experimental inquiry on this subject is, however, as obvious on the part of *practice* as of theory; for, as it has been well observed, "skilful practice is applied science:" if, therefore, the principles which explain the why and the wherefore of the action of the manure, and which consequently ought to direct its application, be not laid down and clearly defined, how is it possible that its proper economy can be understood or observed? On

the contrary, Practice under such circumstances must stumble on in the dark; its course, therefore, cannot be uniform: but even should it be correct in any one particular—should Chance cause any one to

“stumble on the plan
Eyes philosophic failed to scan”—

with no other reason to urge in its favour but our own absolute dictum, or individual practice, it cannot be considered worthy of acceptance or become generally adopted. The *experience* of past years illustrates this. Thus, although bones have now been used generally for many years, we can scarcely meet with two farmers who are agreed on each particular connected with their use, or who adopt a similar practice, as regards either the sort, quantity, or condition of the bones. Still more seldom do we find any who can give a reason for the preference which they may have. In fact, common practice varies essentially in different localities on these and other points connected with their use as manure. Another reason for further experimental inquiry on the subject has lately arisen. Thus, acting on the knowledge that the earthy constituents of bones are found in the structure of the turnip, and on the theory already adverted to—that they are highly essential to its vigorous growth—it has been suggested, that if they were dissolved in weak acid, the particles of the bone would be in a state more accessible to the roots of the plant; and that, as the whole quantity of these substances required during an ordinary course of cropping are contained in less than two bushels of bones, the vegetable would be able to obtain all the food of this description that it required from a much less quantity of bones than is now used. The facts which we have already urged in support of the opinion that fresh bones yield their phosphates more slowly than those which contain no animal matter, owing to the preservative effect which the latter has upon the structure of the bone, render this suggestion still more worthy of attention, as—setting aside the saving in quantity already noticed—it promises us a means of counteracting this tendency without destroying the animal manure in the bone by the action of fire. The action, too, of an acid is a much more effective means of causing a disintegration of the bone than either fire or any mechanical agency—both of which have been proved to promote the action of the manure upon the first crop: and this, be it observed, is all that we need look for from a hand-tillage which produces a green crop, as that crop itself makes manure for the ensuing grain-crop; and if this be not sufficient, we had better have the money in the pocket to buy more hand-tillage with, at the time when it is wanted, than put more with the former green crop than that crop actually required.

To enter fully into the claims to our attention which this suggested practice offers, is, however, unnecessary. These have already been fully discussed in the pages of the Royal Agricultural Journal. Experiment, too, has in an extraordinary manner confirmed them. The results of my own former trials, communicated to the Highland Agricultural Society, of those made by the Duke of Richmond, the Morayshire Farmers' Club, and others, have already been made known through the same medium (Royal Agricultural Journal, vol. v.); and they are such as, while they give great promise that the claims which theory has in this case put forth will be made good, demand further inquiry. And this not merely that the general truth of a theory which promises so much, and has already *performed something*, may be set beyond dispute—as we take it that the facts already proved are pretty conclusive as to the general truth of the advantages claimed for the system—but that all the peculiarities in effect and particulars of the preparation and application of so novel and economical a fertilising agent may be made known, and any difficulties or inconvenience which might retard its general adoption be the more speedily removed.

Such then is the necessity which both theory and practice have for further inquiry into the action of bone manure; and to this necessity is to be ascribed these and other investigations on the same subject which the writer has, within the last few years, undertaken. In the present case, however, he has made repeated trials, the results of which he has previously ascertained and published. As truth, however, cannot be too frequently confirmed, or error too speedily exposed, and as, in fact, comparative results can only be obtained under perfectly similar circumstances, he has done so in order to make the objects and results of his present inquiry the more comprehensive and valuable. And it has been a matter of hope with him that the experience of past labours might enable him to collect information fitted for inductive reasoning, and for building our precept and practice upon.

With what success he has laboured will be seen from the following particulars of the *objects, method, and results* of his inquiry.

I.—*The Objects of Inquiry.*

On the theory of the action of bones, our object is to ascertain,—

1. What is the action of the earthy or inorganic part of bones as a manure?
2. What that of the organic part?
3. Is the united action of the organic and inorganic constituents of bone equal to the total action of both when applied separately?
4. If not, is the circumstance owing to the non-fertilising influence of one, or to the diminished action of the other?

5. Can their united action be promoted?
6. By what means?
7. Will sulphuric or muriatic acid answer the purpose?
8. If so, what part of the action of the mixture is to be attributed to the direct influence of the acid as a manure, and what to the increased action of the bone?

On the practical application of bones as a manure for the turnip-crop, it is intended to ask,—

1. What are the peculiarities of the action of fresh bones? what of boiled bones? what of burnt bones?
2. What sort of bones should the turnip-grower use?
3. Is it economical to boil or burn bones before using them?
4. In what state of division should bones in their natural state be used?
5. What is the comparative effect of bones in their natural state and bones dissolved in acid?
6. What are the peculiarities in effect arising from the use of dissolved bones?
7. What sort of bones are best adapted for use in a dissolved state?
8. What quantity of such bones is it best to apply?
9. What sort of acid should be used?
10. What proportion should the weight of the acid bear to that of the bones used?
11. What proportion of water should be added to the mixture before application?
12. What effect has the acid itself as a manure?
13. What are the general advantages of the solution of bones as a manure?
14. Is there any other feature connected with the preparation or application of the solution which the present trials suggest as worthy of our notice?

II.—Method of Inquiry.

The soil selected for the experiment was a deep sandy loam upon a gravelly subsoil, perfectly dry, free from wood, level, and exposed on all sides. Having had a crop of wheat during the previous year upon clover stubble, depastured in the autumn, the field was properly fallowed and cleaned.

In the middle of the field a patch of 2 acres was next staked out, and subdivided into 20 plots, each containing one-tenth of an acre. These were set out in ridges, at 24 inches distance from each other, and drilled upon the ridge with Matson's white globe turnip-seed on the 1st of July, 1844.

The various manures fixed upon for trial were applied in the quantities and order shown in the subjoined chart of the particulars of the experiment.

CHART of the Particulars of an Experiment with BONES as a Manure upon the Turnip Crop, 1844. Size of the Plots, 1-10th of an Acre.

<p>No. 1.</p> <p>Fresh bones crushed (mixed dust and rough). Weight, 4 st. 11½ lbs.</p>	<p>No. 2.</p> <p>Fresh bones (same as No. 1). Weight, 4 st. 11½ lbs. <i>Boiled</i> 3 hours, so as to extract the oil without dissolving the gelatine, and then dried so as to drive out the water absorbed by the bones during the process. Weight after boiling, 4 st.</p>	<p>No. 3.</p> <p>Fresh bones (same as No. 1). Weight, 4 st. 11½ lbs. <i>Burnt</i> to whiteness, so as to completely destroy the animal matter of the bone (both oil and gelatine). Weight after burning, 2 st. 9 lbs.</p>	<p>No. 4.</p> <p>Bones (No. 1), <i>fine dust</i>; 4 st. 11½ lbs.</p>	<p>No. 5.</p> <p>Bones (No. 1), rough half-inch, the fine dust having been sieved out. 4 st. 11½ lbs.</p>
<p>No. 6.</p> <p>Bones (No. 1) crushed. 2 st. 5½ lbs. Dissolved in half their weight of sulphuric acid, 16½ lbs. Applied with water, 168 gallons, or 100 times the weight of the acid.</p>	<p>No. 7.</p> <p>Bones (No. 1) crushed. 2 st. 5½ lbs. <i>Boiled</i> to 2 st. Dissolved in sulphuric acid, 16½ lbs. Applied with 168 gallons of water, or 100 fold the weight of the acid.</p>	<p>No. 8.</p> <p>Bones (No. 1) crushed. 2 st. 5½ lbs. <i>Burnt</i> to 1 st. 4½ lbs. Dissolved in sulphuric acid, 16½ lbs. Applied with 168 gallons of water, or 100 fold the weight of the acid.</p>	<p>No. 9.</p> <p>Bones (No. 1) crushed. 1 st. 2½ lbs. Dissolved in half their weight of sulphuric acid, 8½ lbs., Applied with 84 gallons of water, or 100 fold the weight of acid, same as No. 6.</p>	<p>No. 10.</p> <p>Bones (No. 1) crushed. 8½ lbs. Dissolved in half their weight of sulphuric acid, 4½ lbs. Applied with 42 gallons of water, or 100 fold the weight of acid.</p>
<p>No. 11.</p> <p>Bones (No. 1). 2 st. 5½ lbs. Dissolved in one-third their weight of sulphuric acid, viz. 11½ lbs. Applied with water, 112 gallons, or 100 times the weight of the acid.</p>	<p>No. 12.</p> <p>Bones (No. 1). 2 st. 5½ lbs. Dissolved in one-fourth their weight of sulphuric acid, viz. 8½ lbs. Applied with water, 84 gallons, or 100 times the weight of the acid.</p>	<p>No. 13.</p> <p>Bones (No. 1). 2 st. 5½ lbs. Dissolved in half their weight of sulphuric acid, viz. 16½ lbs. Applied with water, 84 gallons, or 50 times the weight of the acid.</p>	<p>No. 14.</p> <p>Bones (No. 1). 2 st. 5½ lbs. Dissolved in half their weight of sulphuric acid, viz. 16½ lbs. Applied with water, 42 gallons, or 25 times the weight of the acid.</p>	<p>No. 15.</p> <p>Bones (No. 1). 2 st. 5½ lbs. Dissolved in half their weight of <i>muriatic acid</i>, viz. 16½ lbs. Applied with water, 168 gallons, or 100 times the weight of acid.</p>
<p>No. 16.</p> <p>Bones (No. 1). 1 st. 2½ lbs. Dissolved in half their weight of <i>muriatic acid</i>, 8½ lbs. Applied with water, 84 gallons, or 100 times the weight of the acid.</p>	<p>No. 17.</p> <p>Bones (No. 1). 8½ lbs. Dissolved in half their weight of <i>muriatic acid</i>, 4½ lbs. Applied with water, 42 gallons, or 100 times the weight of acid.</p>	<p>No. 18.</p> <p>—</p> <p>Sulphuric acid, 16½ lbs. Applied with water, 168 gallons, or 100 times the weight of acid.</p>	<p>No. 19.</p> <p>—</p> <p><i>Muriatic acid</i>, 16½ lbs. Applied with water, 168 gallons, or 100 times the weight of the acid.</p>	<p>No. 20.</p> <p>—</p> <p>No manure applied.</p>

N.B.—The whole of the bones used in this experiment were originally from the same stock. Thus,

- No. 1, fresh bones, crushed, are the bones in the state they left the mill.
- No. 2 are the same boiled, so as to lose their oil; which amounted, as will be seen by reference to the loss of weight by the operation, to about $16\frac{2}{3}$ per cent.
- No. 3 are the same bones as No. 1, *burnt* so as to waste all the organic parts, both oil and gelatine. The loss by burning was about 45 per cent.
- No. 4 are the same bones more highly pulverized, so much so indeed as to pass a sieve.
- No. 5 are the same bones merely broken into pieces from one-tenth to a quarter of an inch in length. They were obtained by separating the fine dust of No. 1 from the larger particles.
- Nos. 6, 9, 10, 11, 12, 13, 14, 15, and 16, are the same bones as No. 1, in the crushed state, but applied along with various other substances.
- No. 7: these bones are from the same as No. 1, but boiled, &c., like No. 2.
- No. 8, same bones as are used on No. 3.

From the above it will be seen that the bones employed contain about—

55 parts inorganic or earthy matter,	
45 parts organic	{ viz. $29\frac{1}{2}$ gelatine $16\frac{2}{3}$ oil }
	or animal matter. *

The *sulphuric acid* was diluted with twice its weight of water before it was mixed with bones; and similarly the *muriatic*.

The *dissolved bones* were prepared as follows:—After being very well pulverized, they were put into separate wooden vessels (*i. e.* the quantity for each plot), containing diluted acid. After standing ten days, the proper quantity of water for diffusion was added, and they were immediately applied.

The *liquid applications* were made by spreading the fluid in the bottom of the ridges, and afterwards ploughing the ridges up; so that the seed was drilled upon the top and immediately over the manure, as is usually practised when farm dung is used.

The bones, in their ordinary states, were drilled along with the seed on the top of the ridges.

The following prices were paid for the various manures:—

- Crushed fresh bones, 20s. per quarter, or 10*d.* per stone.
- Sulphuric acid, $1\frac{1}{2}$ *d.* per lb.
- Muriatic acid, $1\frac{1}{2}$ *d.* per lb.

From the foregoing, the following particulars of the applications, *per imperial acre*, are derived :—

No.	Sort of Manure.	Quantity of Bones per Acre.			Quantity of Acid.	Quantity of Water.
		bush.	st.	lbs.	st.	gallons.
1.	Fresh bones, crushed	16	or	48	0	
2.	Ditto, <i>boiled</i>	16	..	40	0	
3.	Ditto, <i>burnt</i>	16	..	26	6	
4.	Ditto, finely pulverized	16	..	48	0	
5.	Ditto, rough	16	..	48	0	
6.	Ditto (No. 1), crushed and dissolved in sulphuric acid	8	..	24	0	12 1680
7.	Ditto, boiled and ditto	8	..	20	0	12 1680
8.	Ditto, burnt and ditto	8	..	13	3	12 1680
9.	Ditto (No. 1), dissolved in sulphuric acid	4	..	12	0	6 840
10.	Ditto ditto	2	..	6	0	3 420
11.	Ditto ditto	8	..	24	0	8 1120
12.	Ditto ditto	8	..	24	0	6 840
13.	Ditto ditto	8	..	24	0	12 840
14.	Ditto ditto	8	..	24	0	12 420
15.	Ditto muriatic acid	8	..	24	0	12 1680
16.	Ditto ditto	4	..	12	0	6 840
17.	Ditto ditto	2	..	6	0	3 420
18.	Sulphuric acid . . . . .	..				12 1680
19.	Muriatic acid . . . . .	..				12 1680
20.	. . . . .	..			..	..

III.—*Results of the Inquiry.*

1. The first result evinced was the decided start which the whole of the dissolved bones took from the very first appearance of the plants.

2. The various plots with dissolved bones came into rough leaf sooner by eight days than the other plots.

3. No. 10 (2 bushels per acre dissolved bones) did not move quite so quickly into rough leaf as Nos. 6 and 9 (8 bushels and 4 bushels, respectively).

4. No. 12 (8 bushels, with only one-fourth part acid) also did not start so well as Nos. 6 and 11 (respectively half and one-third part acid sulph.).

5. Nos. 13 and 14 were also a shade behind the best in their first start; these (Nos. 13 and 14) having only half and one-fourth the usual quantity of water applied.

6. Nos. 17, 18, and 19 (bones in various proportions, with muriatic acid) did not start quite so quickly as the same quantities of bones in the sulphuric acid (Nos. 6, 9, and 10); there was, however, but a shade of difference.

7. *Of bones in their ordinary conditions.*—No. 3 (burnt) took

the start; No. 2 (boiled), and No. 4 (fine dust), being next; No. 1, third; and No. 5 decidedly behind the whole.

8. The plots upon which acids *only* were used were much behind; both Nos. 18 and 19 being no better than 20, which was left unmanured.

9. On the 1st of August the positions of the various plots, so far as regards quick growth, were as mentioned in the foregoing notes—the only other peculiarities observable being that all the plots where the liquid bone mixtures had been used were quite fit for hoeing, and had suffered scarcely anything from the fly; while the other portions, with ordinary bones, were still ten days behind, and had been more seriously attacked. The unmanured plot (20), and also Nos. 18 and 19 (sulph. acid and mur. acid), were at this time scarcely to be called plants; indeed, they were not one-fourth the size of the plants on No. 6, &c.

10. On the 1st of October the whole of the lots were again examined, and their peculiarities noted. The changes were as follows:—

Of the *bones in their ordinary* states, No. 4 (fine dust) was now about the best, and No. 5 (rough bones) the worst. No. 3 (burnt), which took the lead at first, having lost ground slightly. At this time, however, the plots might be said to be very even, with the exception of No. 5 (rough bones).

Dissolved bones.—Under this head all looked extremely flourishing, showing a very early tendency to form bulbs.

In the first section (with 8 bushels of *different sorts* of bones dissolved), No. 6 (fresh bones) seemed the best; Nos. 7 and 8 not having quite such large leaves, though all were marked in first class, and still continued in advance of the other plots—Nos. 1, 2, 3, 4, and 5.

In the section with *various quantities* of bones dissolved, No. 10 was still backward; No. 9 (4 bushels per acre) being very nearly up with the best.

Nos. 11 and 12 (having respectively one-third and one-fourth weight of acid to that of the bone) have improved; they were now equal to the lots where the acid was in larger proportion. They are put in first rank.

Nos. 13 and 14 (with half and one-fourth the usual weight of water, *i. e.* with fifty and twenty-five fold the weight of the acid) had also made equal progress, and were marked “first rank.”

The muriatic acid, Nos. 15, 16, and 17, had also come up fully to the very front rank, having quite as fine bulbs as No. 6, &c., and, if anything, a darker leaf. They were now marked with the first rank, and were twice as heavy as Nos. 1, 2, &c., with ordinary bones.

Nos. 18, 19, and 20 were all miserably bad.

Beyond these peculiarities, which were noted at the time, no particular variation was observed; the dissolved bones manifesting their superiority to the end of the season, and being ready for use a month before the rest.

The whole of the experimental plot was hoed by one person, and the land between the ridges regularly cleaned with the scuffler.

On the 30th of January, 1845, the turnips were topped and tailed, and the gross weight of the produce of each plot ascertained; the following being the results:—

No.	st.	lbs.		No.	st.	lbs.	
1.	162	12	per 1-10th of an acre.	11.	242	2	per 1-10th of an acre.
2.	152	2	„	12.	220	10	„
3.	150	0	„	13.	257	2	„
4.	171	6	„	14.	231	6	„
5.	124	4	„	15.	248	8	„
6.	257	2	„	16.	233	8	„
7.	229	4	„	17.	188	8	„
8.	227	2	„	18.	93	3	„
9.	201	6	„	19.	92	2	„
10.	154	4	„	20.	90	0	„

Annexed is a tabular statement of the particulars of the various applications, and of their peculiar and final results upon the crop, calculated on the scale of an imperial acre.

By comparing the results in this summary, and the peculiar circumstances connected therewith with each other, we obtain the following answers to the questions which it was our “object” to elucidate:—

On the Theory of the Action of Bone Manure we learn:—

1. That the inorganic part of bones is the most valuable fertilizing constituent.

In proof of this we find that No. 3 (48 st. of bones reduced by burning to 26 st. 6 lbs.) gives a produce of 9 tons 7 cwt. 4 st., while No. 1 (fresh bones, 48 st.) only gives 10 tons 3 cwt. and 4 st. per acre. Now, as it is well known that the animal oil must first leave the bone—must first be extracted by the plant, before the earthy part can decompose and be taken up by the roots; it is evident that in No. 1 the turnip has the use of *all the animal*, and *some* of the *earthy* part. In No. 3 the plant has the benefit of the earthy part only: and yet the difference in result is trifling. It is therefore evident that the earthy part alone is superior to the animal part alone.

Again, compare the results of Nos. 6 and 8, where the bones are dissolved, and both portions can have free action (for it will be evident that in No. 1 the earthy part has not been as ready for use as in No. 3, or it would, assisted by the animal matter, have greatly excelled No. 3 in effect).

In this comparison we find that

TABULAR SUMMARY of the Details and Results, per Imperial Acre,

Section of the Experiment.	PARTICULARS OF THE MANURES			
	—	Weight of Bones.	—	Weight of Acids.
Nos. 1, 2, and 3.	1. Fresh bones, crushed, dust and rough mixed, 16 bush.	st. lbs. 48 0	. .	stones. ..
With various sorts of bone	2. Ditto ditto, boiled and dried .	40 0	. .	..
	3. Ditto ditto, burnt to whiteness	26 6	. .	..
Nos. 1, 4, and 5.				
With bones in different states of division	4. Ditto ditto, fine dust	48 0	. .	..
	5. Ditto ditto, rough	48 0	. .	..
Nos. 6, 7, and 8.	6. Ditto ditto, dust and rough mixed, 8 bush.	24 0	Dissolved in half their weight of sulphuric acid.	12
With various sorts of bones dissolved	7. Ditto ditto, boiled, &c., to	20 0	ditto	12
	8. Ditto ditto, burnt, &c. to	13 3	ditto	12
Nos. 6, 9, and 10.				
With different quantities of bones dissolved	9. Ditto ditto, 4 bushels	12 0	ditto	6
	10. Ditto ditto, 2 ditto	6 0	ditto	3
Nos. 6, 11, and 12.				
With bones dissolved in different proportions of acid	11. Ditto ditto, 8 ditto	24 0	Dissolved in 1-3rd their weight of sulphuric acid.	8
	12. Ditto ditto, ditto	24 0	ditto in 1-4th ditto	6
Nos. 6, 13, and 14.				
With bones dissolved and applied with different proportions of water	13. Ditto ditto, ditto	24 0	ditto in half ditto .	12
	14. Ditto ditto, ditto	24 0	ditto	12
Nos. 6 and 15.				
Bones with different acids.	15. Ditto ditto, ditto	24 0	ditto in half their weight of muriatic acid.	12
Nos. 15, 16, and 17.				
With bones in various quantities, in muriatic acid	16. Ditto ditto, 4 bushels	12 0	ditto	6
	17. Ditto ditto, 2 ditto	6 0	ditto	3
Nos. 18, 19, and 20.				
With different acids alone, and no manure	18. ..	..	Sulphuric acid . .	12
	19. ..	..	Muriatic ditto . .	12
	20. No manure . . . . .	..	. .	..

No. 6. (8 bushels of *fresh* bones dissolved in sulphuric acid) gives 16 tons 1 cwt. 3 st. per acre.

No. 8. (8 bushels of fresh bones *burnt* and dissolved in sulphuric acid) gives 14 tons 3 cwt. 7 st. per acre.

Showing a difference in favour of the fresh bones of less than 2 tons.

This therefore is the *extra produce* arising from the animal matter of the bone, and 14 tons 3 cwt., &c., is the effect of the earthy portion; for

of an Experiment on the Action and Application of Bones as a Manure.

EMPLOYED.		RESULTS.				
—	Quantity of Water.	Cost of the Manure applied.	Appearance on the 1st of August. 1 ^o represents the highest merit; 4 ^o , the lowest do.	Appearance on the 1st of October. 1 ^o represents the highest merit; 4 ^o , the lowest do.	Weight on the 30th Jan. 1845.	No. of Plot.
	Galls.	£. s. d.			T. cut. st. lbs.	
. .	..	2 0 0	24 ^o Ten days behind 1 ^o , and look only moderately; fly has plagued them.	2 ^o . Medium crop; has improved.	10 3 4 8	1
. .	..	2 0 0	24 ^o . Shade better than the above.	2 ^o . Ditto; has lost ground	9 10 1 6	2
. .	..	2 0 0	2 ^o . These have made best start of any of the undissolved lots.	2 ^o . Made a good start, but has not continued quite as it promised.	9 7 4 0	3
. .	..	2 0 0	24 ^o . Nearly equal to 2 ^o . .	2 ^o . Has grown pretty evenly from the first.	10 14 2 4	4
. .	..	2 0 0	3 ^o . Decidedly worst of the undissolved lots.	3 ^o . Still behind the above .	7 15 2 12	5
and water equal to 100 fold the weight of the acid	1680	1 19 6	1 ^o These look extremely well, seem to have grown twice as fast as the section above—are quite ready for hoeing. They are more than twice the size of plants marked 2 ^o , &c. They have outgrown the attacks of fly.	Will be a good fair crop; they still keep in advance of 2 ^o & 3 ^o greatly. Leaf is much broader, and they now are forming bulbs better than the other.	16 1 3 6	6
ditto . .	1680	1 19 6	1 ^o	1 ^o	14 6 4 12	7
ditto . .	1680	1 19 6	1 ^o	1 ^o	14 3 7 6	8
ditto . .	840	0 19 9	1 ^o	14 ^o . Has not quite maintained its place.	12 11 6 4	9
ditto . .	420	0 9 10½	14 ^o . A shade less in size of leaf than 1 ^o .	2 ^o . These have not kept their lead.	9 12 6 12	10
ditto . .	1120	1 13 0	1 ^o . Same as rest marked 1 ^o .	1 ^o .	15 2 5 6	11
ditto . .	840	1 9 9	14 ^o . Shade inferior to 1 ^o .	14 ^o . Same as rest of lots 1 ^o . Have improved their position lately.	13 15 7 2	12
in 50 fold water	840	1 19 6	14 ^o . Ditto	1 ^o .	16 1 3 6	13
in 25 ditto . .	420	1 19 6	14 ^o . Ditto	1 ^o .	14 9 2 4	14
in 100 ditto .	1680	2 1 0	14 ^o . These not quite so large in the leaf as 1 ^o , but are equally blooming; are full 10 days in advance of 2 ^o , &c.	Very blooming; leaves now equally large with other plots. 1 ^o . Colour slightly darker. Bulbs forming well; nearly twice as heavy as 2 ^o in bulb.	15 10 5 10	15
ditto . .	840	1 0 6	14 ^o .	1 ^o .	14 11 7 10	16
ditto . .	420	0 10 3	14 ^o .	1 ^o .	11 15 5 10	17
ditto . .	1680	0 19 6	4 ^o . Very bad. Some plants can scarcely be seen; the fly has severely punctured them.	4 ^o . Very bad. Have scarcely made anything like a broad leaf or bulb.	5 16 4 2	18
ditto . .	1680	1 1 0	4 ^o .	4 ^o .	5 15 1 6	19
. .	..	..	4 ^o .	4 ^o .	5 12 4 0	20

the only difference in the two applications is that No. 6 contains 45 per cent. of oil and gelatine, while No. 8 contains none. This conclusion is in accordance with the facts already stated, that the amount of animal oil contained in bone could not possibly produce an effect equal to that which has been shown to arise from the earthy part alone in several cases. (*Vide* my 'Prize Essay on the Use of Hand-tillages,' Longman and Co.; and 'Prize Report on the Effects of *Special Manures*,' Transactions of the Royal Highland and Agricultural Society of

Scotland, March, 1844). In this case, then, the increase arising from the 45 per cent. of organic matter (water, oil, and gelatine) is about 1 ton 17 cwt. per acre, while that arising from the earthy part is about 8 tons 11 cwt. per acre. This last result is obtained by subtracting the produce of the soil *without manure* (No. 20), viz. 5 tons 12 cwt. per acre, from that of No. 7 (burnt bones dissolved). It will also be observed that none of this effect arises from the action of the acid as a manure of itself; for though it promotes the action of the bone, it has no effect of consequence if applied alone. (*Vide* Nos. 18 and 19.)

2. That the organic part of bones has also a very beneficial effect upon the crop.

The remarks under the foregoing conclusions will illustrate this. In all cases where it is applied in addition to the earthy part it will be seen that it has encouraged vegetation. Thus compare No. 1 with No. 3, and No. 6 with No. 8. It should also be observed, that its total action is greater than the difference between No. 1 and No. 3 shows, because, as will be shown, the phosphates, &c. in No. 1 do not act so fully as in No. 3. The effect therefore of the animal matter is not clearly shown by a comparison of No. 6 and No. 8. It will be observed, too, that one part of the animal matter, the gelatine, has also a visible effect in the cases where boiled bones are used.

3. That the action of the organic and inorganic parts of bone applied in natural union, is not equivalent to the total of their separate fertilizing capabilities.

In proof of this it will be seen, by reference to the 'Summary of Results,' that any means of separating, or reducing the particles of the bone, so as to make their separation more easy in the soil, greatly increases the effect arising from the manure. This increase of effect arises, therefore, from the increased action of their materials. In ordinary cases, therefore, we may conclude that they do not act up to their real capability. For example of this, note the greater efficacy attained by pulverizing, or by dissolving the bones before using, compared with the inferior action of bones in a rough state. The increased effect of the bones dissolved is *threefold*; as one-fourth the quantity used generally here answers as well as the larger quantity. And as the *acid* has *no effect* as a manure, the effect from the bones is trebled; in their ordinary condition they, therefore, *only act partially*, or that action could not be increased.

5. That this circumstance is not owing to one of the matters having a non-fertilizing influence, but to the action of the earthy part being *retarded*, and consequently for that crop *lessened*, by its union with the animal oil, &c. of the bone.

The first part of this position has already been proved—both the animal and earthy matter having been shown to be manures. That the animal oil retards the action of the other portion is shown by the circumstances that the dissolution of the union of the two parts by an acid promotes both the *immediate* and total *action* of the manure; that the pulverization of the bone, and the consequent more free admission of

water and the acids of the soil, produce improved results (compare Nos. 4 and 5); and that by taking away the animal matter totally (as in No. 3), or partially (as in No. 2), the immediate action of the earthy part is encouraged. (See appearance of crop, 1st August.) In every case it will be seen, by reference to the 'Summary of Results,' &c., that where the union of the two is least meddled with, the action of the bone is slowest; for instance, No. 5 (bones in the rough state) ($\frac{1}{2}$ inch) give throughout worse results than bones in any other form. That this is owing to the slow yield of phosphate, &c. the other cases show. This result is in perfect conformity to the well-ascertained facts alluded to in the introductory part of this paper—that oil has a preservative effect upon the bone, and that (*vide* Analysis, Johnston's Lectures, p. 657) it must escape before the earthy part can be separated and made use of.

6 and 7. That this injurious influence may be counteracted, and the united action of the two main constituents promoted for the present crop, by reducing the bones to as fine a state of division as possible.

The *fact* here stated is proved by a glance at the comparative results of the bones in different states of division, No. 1 (crushed), No. 4 (pulverized), and No. 5 ($\frac{1}{2}$ inch rough), the results from which are respectively 10 tons 3 cwt., 10 tons 14 cwt., and 7 tons 15 cwt. The *rationale* of this effect has already been explained.

8. That either sulphuric or muriatic acid may be employed with extraordinary success as a means of facilitating the action of the constituents of the bone.

A reference to the results will best explain this extraordinary success of the application—success so great, that one-fourth the quantity of bones usually employed have an effect, if applied in the manner proposed, equal to that of the most liberal application.

On the Practical Application of Bones as a manure for the turnip crop, we learn—

1. That the total benefit to the crop arising from fresh bones, in a *favourable state for application*, is greater than from the same quantity of bones from which the animal matter has been extracted; that boiled bones (that is, the same quantity of the fresh bones reduced to a less weight by boiling) are a little quicker in their influence; and that the same weight of fresh bones, reduced by burning to a still less weight, are more immediate in their operation, but fail slightly in their later effects.

A glance at the particulars in the summary will show this. The cause has been shown in the theoretical results deduced. The fresh bones must, however, be in a fine state of division to be in the '*favourable state*' alluded to. (*Vide* No. 4.)

2. That the turnip grower should use dry bones, *i.e.* boiled or burnt bones, or any other from which the animal matter has partly escaped, when he purchases *by weight*, as he will in that

case get more of the earthy matter of bone (which has been already proved to be the most valuable portion) than he will in the same weight of fresh ones; but when he purchases by *measure*, it will be to his advantage to buy fresh ones, as he will get a large per centage of animal matter in addition to their earthy constituents, without an equivalent or proportionate increase of bulk.

Forty-eight stones of fresh bones are reduced by burning to 26 st. 6 lbs., and yet they nearly equal 48 st. of fresh bones in total effect: 48 st. of *burnt* or dry bones would therefore undoubtedly greatly surpass the same weight of fresh ones. That it would be more advantageous to have any *given weight* of the earthy part of bones in preference to the same weight of the animal and the earthy parts combined is clear for two reasons; because the action of the inorganic is superior to that of the organic alone, and because the united action of both is not equal to their total separate effects: both of which positions have been proved. As to the next point, if we buy *by measure*, we may as well have the animal matter in the bone (it being a fertilizer), because, if it be taken out, the bulk of the bones is not diminished in proportion to the weight taken out. Thus 40 per cent. organic matter taken from a quarter of bones will not cause them to measure 40 per cent. less.

3. That it is not judicious economy to boil or burn bones before using them, in order to improve their effects, because by so doing we *totally destroy* the organic part of the manure; and though we may, perhaps, promote their immediate action, we do not gain anything in the total effects arising from the application.

What has already been stated, in conjunction with the results also quoted, fully illustrates this conclusion.

4. That instead of burning bones to accelerate their action we should (if we have fresh bones to use) pulverize them as finely as possible, in order to counteract the tendency which it has already been proved that the animal part has to prevent the earthy part from coming into action; as by such operation we reduce the particles of the bone, fermentation and decomposition speedily ensue, the oil is more easily washed out of the small particles, water and the acids of the soil take its place, and the inorganic constituents are, therefore, soon made fit for assimilation by the plant.

For facts in support of our position compare Nos. 4 and 5. The theory of the cause of the improved action of No. 4 has been sufficiently discussed. I beg to note, however, the perfect coincidence in result of this trial between No. 4 and No. 5, with those obtained from similar applications last year, the particulars of which trial may be found in my Report on Special Manures. (Prize Essays of the Highland Agricultural Society, March, 1844.)

5. That bones dissolved in acid have a much greater and readier fertilizing influence than any sort of bones not so prepared.

The first and final effects of both sorts may be seen by comparing the results of the applications Nos. 1, 6, 9, and 14. Thus—

No. 1.—	16 bush. bones give	10 tons 3 cwt. 4 st. 8 lb. per acre.
6.—	8 „ dissolved give	16 tons 1 cwt. 3 st. 6 lb. „
9.—	4 „ dissolved give	12 tons 11 cwt. 6 st. 4 lb. „
16.—	4 „ dissolved give	14 tons 11 cwt. 7 st. „

Nos. 6, 9, and 14, too, it will be observed, also took the lead from the commencement.

6. That the peculiar effects arising from the application of dissolved bones are not merely an augmented crop at a decreased cost in manure, but a crop showing an abundant, healthy, and extraordinarily quick-growing young plant, a decided tendency to form bulbs at a much earlier period than common, and less liability to damage from the enemies which usually attack the turnip in the early period of its growth.

It will be observed that there was a gain in the growth of the dissolved plots of ten days in the first month. It may be added, that there was a gain of a month at the end—the dissolved portions being ready for use several weeks before any other.

7. That all sorts of bones are well adapted for use in this manner; but that it is a bad economy to burn or boil the bones in order to prepare them, as we waste a valuable manure in the organic matter, and the total effect arising from such will not be the same that it would had they not been subject to a process which materially reduces the weight of manure applied. If, however, bones are to be bought for this purpose, the same rule will hold that we have laid down before, as regards bones in their ordinary state. Thus, if we buy *by measure*, it will be advisable to have the animal matter *in the bone*, as it does not materially augment the bulk of the bone; but if we buy *by weight*, we cannot have over little of the animal part, as the earthy is comparatively the more valuable: and when we pay by weight, we cannot have too great a proportion of the best material.

All the sorts of bone are augmented in their action by being dissolved (*Vide* Nos. 6, 7, and 8). The animal part in No. 6, it will be seen, has some effect, and therefore it should never be *wasted*, as the action of the acid removes the influence which it possesses in ordinary cases over the action of the earthy part. In No. 6 it will be seen that there is 10 st. 8 lbs. more matter of the bone applied than in No. 8; this 10 st. 8 lbs. being the amount of the animal substance in the 24 st. of bones applied. If now No. 8, instead of 13 st. 6 lbs., had had 24 st. of the earthy part of bone (*i.e.* 10 st. 8 lbs. extra), it would, no doubt, have equalled and perhaps surpassed in results No. 6, which had 13 st. 6 lbs. of the earthy and 10 st. 8 lbs. of the animal part of bones applied; as, under present circumstances, there is not a great difference in the weight of the crop produced. If, therefore, we can buy by weight the dry earthy parts of bone for this purpose, we had better have it than the same price for the

animal matter which is in fresh ones, when it has been proved that that part is not equal to the other in relative value.

8. That 2 bushels of bones per acre will actually produce as good results as 16 bushels of bones in their ordinary state in some cases; that 8 bushels of bones dissolved will greatly surpass 16 bushels of bones in any other manner; and that 4 or 6 bushels per acre is a fair quantity to apply in the state of solution—the results being greatly superior to those from fourfold the same quantity of bones applied in the usual manner, and the cost of the application less in proportion to the amount of effect produced (evidenced by the weight of the crop) than that of any other quantity.

For results from 2 bushels of bones dissolved compare No. 10 (9 tons 12 cwt.) and No. 17 (11 tons 15 cwt.) with the results of 16 bushels of crushed bones, No. 1, (10 tons 3 cwt.)

For results from 8 bushels of bones dissolved compare Nos. 6 and 15 with No. 1.

Nos. 7 and 16 (each 4 bushels of dissolved bones per acre) give respectively—

14 tons 6 cwt. 4 st. at a cost of 19s. 6d. per acre.

14 tons 11 cwt. 7 st. „ 20s. 6d. „

And No. 1 (crushed bones, 16 bushels per acre)—

10 tons 3 cwt. 4 st. at a cost of 40s. 0d. „

9. That either sulphuric or muriatic acid may be used with success in dissolving bones.

Although a slight difference may be traced between the visible effects of the solutions made with different acids, the final results show no decided difference in favour of either. The cost and convenience is the criterion.

10. That though one-half the weight of the bone is the proportion of acid that has been generally used hitherto, one-third of the weight of the bones to be applied per acre will answer extremely well; and that even one-fourth the weight of the bone may, if occasion demands it, be used with success.

This is an important point in the economy of the manure, as it affects the cost materially. That our conclusion is warranted see the following results:—

No. 6.—8 bush. bones (24 st.) and 12 st. of acid cost 1*l.* 19s. 6d., and gave 16 tons 1 cwt. 3 st. per acre.

11.—Ditto (24 st.) and 8 st. of acid cost 1*l.* 13s., and gave 15 tons 2 cwt. 5 st. per acre.

12.—Ditto (24 st.) and 6 st. of acid cost 1*l.* 9s. 9d., and gave 13 tons 15 cwt. 7 st. per acre.

While No. 1, 16 bushels of bones in an ordinary state cost 2*l.*, and gave 10 tons 3 cwt. 4 st. per acre.

11. That though the bones have usually been mixed in water to the amount of 100 times the weight of the acid, one-half that

quantity will answer equally well; and that even one-fourth the ordinary quantity, or 25 times the weight of the acid, will serve the purpose required very efficiently.

This fact is one which will be of great use. One of the main practical difficulties to contend with in the application of dissolved bones was the large quantity of water which was considered necessary.

These results, however, show that 4 bushels of bones (or 12 st.), 6 st. of acid, and 300 st. of water (at 50 fold) = 420 gallons per acre, will suffice, or at 25 fold, 210 gallons will serve.

While upon this question it will not be improper to state, that the objection to the liquid form of application may be done away with by using the manure in the compost form, as practised by Mr. Tennant Ayr, and detailed in the *addition* to my paper on *Sulphuric Acid*, in the 'Journal of the Royal Agricultural Society of England,' vol. v. p. 596.

As, however, it is proved in this case that so small a quantity of water will serve us, and as it is not requisite to place the manure in immediate contact with the seed, (all the dissolved bones in these trials being spread in the ridge, and then covered up with the plough, before the seed was drilled,) a simple barrel for the distribution of the liquid may be easily constructed.—(Vide my paper on Action of Dissolved Bones, 'Journal of the Royal Agricultural Society,' vol. v. p. 467.)

12. That the sulphuric and muriatic acids have no fertilizing influence of themselves; and that the whole of the beneficial results from dissolved bones is owing to the increased efficiency of the bones.

Compare 18 and 19 with 20 for proof of this. It has been thought that some of the acid might form salts with the alkalies in the soil, and thus have some effect upon vegetation; but such is not the result in this case.

13. That the general advantages arising from the use of dissolved bones, instead of the ordinary bone-dust, are—1st, a great saving in the cost of the application; 2nd, a gain in the greatly augmented produce; 3rd, a crop which grows so quickly that the fly, and other enemies of the turnip's infancy, cannot afflict it so seriously as in ordinary cases; 4th, a crop which shows so early a tendency to form bulbs that it affords us the means, by *sowing early*, of getting an early crop for autumn feeding, or, by sowing late, of securing a crop when no other known means could effect it, and when our land, owing to peculiar circumstances, has not been fit for the seed at an earlier period.

The three first advantages have already been explained, and the fourth is of equal consequence. In the present case the crop was sown at a later period than usual, as a test of the forcing quality of the manure; and it is fully proved, not only by final results, but by the fact of the turnips under its influence arriving so soon at maturity.

The advantages of an *early crop* are well known when we want food for sheep in the autumn. An early crop of turnips, too, will give more

food than a crop of rape, and let us get a crop of wheat after it quite as well. By *sowing late* occasionally, we are able to get a *weedy fallow clean*; and this is of importance to a *whole* rotation. Weather also, and other circumstances, may make us in some cases later with sowing than usual. The means of hastening and securing a crop are therefore of some value.

But again, we may want to get two green crops after wheat, that is, by sowing a crop of autumn turnips as soon as wheat is cut, and another, or a crop of rape, next spring; or by sowing rye and tares, &c., in the autumn for spring feed, and turnips in the ensuing summer. There are other crops which, sown in autumn or early spring, afford a chance for a late crop of turnips after the first is gathered. In all these cases, then, the dissolved bones come to our use, and enable us to do effectually that which we have hitherto only attempted to do; for, owing to its *forcing* effect, it may be said to give us an extra month of growing weather.

14. That it is worthy of notice, as regards the *preparation of the mixture*, that, in order to render the solution more complete, the bones should be pulverized as much as possible before they are mixed with the acid; but that should this, through any means, not be the case, and a few of the larger portions of bone be left undissolved, this will have no injurious effect, as there will be sufficient dissolved for the plant in its early stages, and the larger particles will operate towards the end of the season.

And that it is not necessary to apply the seed and the liquid in contact, or at the same time. Instead, therefore, of an expensive and complicated drill-machine, any simple vessel that will deposit a muddy liquid in the bottom of a furrow will serve the purpose.

These are two important considerations, as the *preparation* and *application* of the mixture are the only points on which a *shadow* of objection can be urged against the manure; and these difficulties will be found to be rather the effect of our own inexperience than the unavoidable results of the system. Thus, as to preparation, the foregoing trials with weak acid (Nos. 11 and 12) prove that one-third and one-fourth the weight of the bone will serve; and that, though the solution be *not* perfect, the final results are not affected. Thus No. 11 (with 6 st. instead of 12 st. of acid) began a little behind the other plots with a larger share of acid, but stood, on second inspection, in the first rank (October 1, 1844).

As to the second point, I trust that another year will not pass without a simple and cheap drill-cart, for the purpose of distributing this peculiar mixture, being exhibited to the members of the Royal Agricultural Society. The object to accomplish being simple, I hope that economy in construction will not be lost sight of, as the farmer cannot afford expensive drills for each description of manure. In such case the public will soon both appreciate its use, and the value of the application.

I dwell on this point because I am aware that a little practical difficulty of this sort often retards the spread of a beneficial practice, and that the only way to promote it is to give the farmer an economical means—a *cheap and easy way of trying it*.

Supplementary Note.

To the traveller who has journeyed long and sedulously, the attainment of his object, and the discovery at the same time, in the realization of his expectations, that his labour has not been fruitless, are matters of high gratification. In a similar manner the results of the present inquiry afford peculiar satisfaction to the writer, as they not only confirm his previous investigations, but convert the anticipations of science, on a most important question connected with the economy of the manure, into the certainty of fact.

For instance, the theory which the facts now developed sustain, is the same which the facts previously elicited suggested: viz., that both the organic and inorganic parts of bones are fertilizers; that the total action of the inorganic is greater than that of the organic; that when applied in conjunction, the latter has a tendency to retard the action of the former; that this tendency may be counteracted by pulverizing the bones; that it may be most effectually accomplished by dissolving the bones in a diluted acid; and that the fertilizing influence of the bones thus treated will be quadrupled.

This latter conclusion is, moreover, a *practical truth* of the greatest value, as it offers a saving of one-half the usual cost of the manure; and the various circumstances under which the several applications which support this conclusion were tried, *without one contradictory result*, place that conclusion beyond the possibility of error, and justify us in asserting that practice has already realized what theory previously promised—"the most important saving which was ever held out in the use of manure." *

February 27, 1845.

V.—*Bones and Sulphuric Acid.* By W. C. SPOONER.

As the Council invites the attendance and co-operation of members, and as the subject of the application of bones and sulphuric acid has so recently engaged its attention, I beg to communicate the result of an experiment tried by me during the last year. In the greater number of instances the bones and sulphuric acid have been applied in a *liquid* state, and though there is reason to believe that the most favourable results are likely to follow this mode of application, yet the trouble and inconvenience attending it, involving, as it does in the first place, a serious outlay, and the difficulty of confining the liquid to the drills, are so great as to preclude farmers generally from availing themselves

* Mr. Pusey, *Royal Agricultural Journal*, vol. iv. p. 408.

of the important and valuable discovery. It must therefore be very desirable to show them that the bones and acid can be applied by the common drill; and having done so during the last year, I beg to communicate the information. Wishing to try several manures, I devoted a piece of land of about four acres to the purpose. On the 4th of July the Swedes (Matson's) were drilled under very unfavourable circumstances. The land, a loam on the London clay, was drained in May, and what with the cartage of the tiles, the clay brought to the surface, and the remarkably dry weather that succeeded, the knobs were of such a nature as to defy the continual application of the harrows and the roller, and (having no clod-crusher at the time) could only be reduced to a *comparative* state of fineness by a number of men with sledge-hammers. The nature of the land will be better understood by my saying that it precisely resembled the field immediately adjoining, on which the trial of implements for heavy lands by your Society took place in July last. I intended to apply the bones and acid at the rate of $3\frac{1}{2}$ bushels per acre of the former, and one-half by weight of the latter. I accordingly prepared sufficient for half an acre, by putting the bones in the state of dust in a tub, and adding about 40 lbs. of acid, and four times the quantity of water. After some hours a few bushels of fine mould was added, and the following day a sufficient quantity of coal-ashes, to make the whole amount to 15 bushels; my object being to drill the field at the rate of 30 bushels per acre. I should have tried the mixture to a greater extent, but could not at that time procure the acid for less than $2\frac{1}{2}d.$ per lb. I also used other manures, such as South American guano, gypsum and guano, bones and guano, and bone-dust, at the rate of 16 bushels per acre, with ashes. But having unfortunately lost the memorandum of the experiments, I can only speak from memory, and must therefore confine my remarks principally to the effects of the bones and acid, and the bones alone. This, however, I may say with regard to guano, that the experiment convinced me that this valuable manure can be readily and safely applied with the common drill (without any particular provision being made for covering the manure with earth before the deposition of the seed) by merely mixing the guano with about four times the quantity of fine mould, and adding as much ashes as the drill will deposit. In the case in question the guano was used at the rate of 3 cwt. per acre, and the mould and ashes were added so as to make the whole amount to 30 bushels per acre.

The bones and acid were used three days after their preparation, and at the same time as the other manures; but whilst the latter were consumed by the quantity of ground intended for each, the former, from being in a somewhat damp state, often adhered

to the cups or scoops of the drill ; and as I did not discover this till the intended half acre was nearly finished, the result was that the bones and acid intended for one-half, extended to three-fourths of an acre, being at the rate of little more than 2 bushels of bones per acre. Now the remedies for this evil which suggest themselves are, to prepare the compost for a longer period, previously using a less quantity of water and a greater quantity of ashes, and looking occasionally to the scoops of the drill, and cleaning them out. But as the application of manures to the turnip crop in a *damp* state must be (if practicable) of great importance and advantage, it is, I venture to suggest, a matter well worthy the consideration of the *inventors and judges* of drills, to contrive that the scoops shall not retain the manure, though damp, after each rotation, either by rendering them less concave, or otherwise altering their shape, or having some method of scraping or cleaning them.

The *bones and acid turnips* were the first to appear above ground ; the tops grew luxuriantly, and for some time maintained a superiority over the rest of the field ; the guano turnips, however, after some time, rivalled them ; and those manured with bones alone, though lagging behind terribly at first, made amends towards the latter end of the autumn ; and on weighing a few rods in the month of December, scarcely any difference could be discovered. The bones and acid roots were the largest, but exhibited more bare spots, probably owing to the irregularity of the deposition of the manure from the cause before mentioned. Besides which I should state that they laboured under the disadvantage of being on the outside of the field, and near a high hedge. To say the least, however, 2 bushels of bones, with the addition of the acid, successfully rivalled eight times the quantity of bones, though the latter was employed on land considered previously much superior to the other. I beg to conclude my remarks on this interesting subject with the observation that, when we find that sulphuric acid enters very largely into the constituent parts of the Swedish turnip, are we not justified in concluding that the remarkable effect attending the application of the bones and acid united is in some measure to be attributed to the specific virtue of the acid in affording food to the plant ? 100,000 parts of Swedish turnips contain no less than 890 parts of sulphuric acid, being twice the quantity of phosphoric acid possessed, whilst the common turnip has but 41 parts of the former and 73 of the latter. Would not some experiments with common turnips drilled with bones and acid, and also guano for comparison, throw some light on the subject, and deserve the recommendation of the Council ?

Southampton, April 22, 1845.

The best mode of mixing the acid and bones is that suggested by a gentleman living at Caistor in Lincolnshire, who recommends that a conical heap of dry mould or ashes should be formed with a hollow space at the top, in which the bones are placed, and the acid afterwards poured upon them. After a short time the whole may be mixed together, and used as a compost to be drilled with the turnip-seed, which seems far better than the attempt to distribute the solution with any liquid manure-cart. I have tried this method of mixing, and it answered perfectly.—PH. PUSEY.

VI.—On Fattening Cattle. By GEORGE DOBITO.

PRIZE ESSAY.

PRESUMING that the object of the Council of the Royal Agricultural Society of England, in offering prizes for Essays on various subjects, is that the farmers themselves may be induced to commit their practice and experience to paper, I trust that my humble attempt to describe what I have found to be the best method of fattening bullocks, if considered unworthy of a prize, may at least be criticised with lenity, as it is the *bonâ fide* production of a practical farmer.

The first point I wish to impress upon my readers is to have a good sort of bullock to begin upon; not that I wish to recommend one particular breed, to the depreciation of all others, for I am sure that different localities require different descriptions of animals; but to caution them that it is right to select the characteristic marks of the breed they intend purchasing—to warn them particularly never to buy a coarse, ill-made, bad-bred animal, because they may fancy it cheap. A man has never got so bad a bargain as when he has, as the saying is, “got too much for money.”

The first criterion for judging of the disposition of the beast to fatten quickly, in my opinion, is that peculiar soft, supple feel of the skin which is commonly called handling well; this is generally accompanied by hair of a soft, fine quality, in great plenty; the eye should be full and clear, and the head well-formed, the shoulders not upright, but lying well back, the chest full, the ribs deep and well arched out, the flanks well down, the hips nearly level with the backbone, and in proportion to the rest of the carcase as to width, the rumps wide, and not too low down, appearing as if when fat the tail and rumps’ ends would be level (but this the butchers in my neighbourhood are in the habit of calling the fool’s point), the purse should be of a full size, and soft to the touch (this I consider a material point), the twist good, and the legs short and small in proportion to the carcase, as the ossal will be light in proportion to the leg-bone.

Next observe the temper of the animal : in selecting from a considerable drove you will often find beasts possessing many of these good points, yet in lower condition than some of the animals of a worse appearance; consider well whether this may not arise from the masterful disposition of the ill-made one; and whether, when put to fatten where every beast may eat his share of food without disturbance, the good-bred one will not soon surpass his more masterful neighbour. If you observe a beast that is constantly watching an opportunity of goring any other that comes in his way, leave him behind, even if he is much heavier than those you select; he may be a great trouble to you: and although the jobber may think you have selected them badly, he will sell them according to what they are worth at the time, and the present weight is the great point with him. For this reason always select the animals before purchasing, rather than agree to give a certain price per head to pick where you like from the drove.

I think the quality of an animal is of more consequence than his form, for common fattening purposes, but have both good if you can. But if you are thinking of fattening an animal to show for a prize, be sure to have his form as perfect as possible; for all the flesh you may lay on him will not hide any great defect in his form: also ascertain, if possible, how the animal is descended; ten to one but the progeny becomes similar to the progenitor. But this is generally a most unprofitable affair, and I strongly recommend all young farmers to leave it in the hands of those gentry who can afford the loss, many of whom there are in the country, and they deserve our best thanks for their patriotism, for it certainly shows the capabilities of different breeds, and thereby enables the observing farmer to profit by the experience of others. Never buy any animals that are *excessively* poor; they will consume a great deal of food before they are got into health enough to fatten.

I fear I have been rather prolix in these remarks, but have thought it necessary; for depend upon it, unless your animals are well bought, fattening cattle will never pay enough to leave the manure clear profit, which it ought to do, although I fear, with the majority of farmers, it is far otherwise.

I shall say but little with respect to summer-grazing, as the wording of the Society's advertisement appears to apply more particularly to winter fattening; merely remarking that the fences should always be kept thoroughly good, a weak place being strengthened before it becomes a gap, prevention in this case, like many others, being better than cure; that the bullocks should be well supplied with water, and have plenty of shade; never allow them to be frightened by dogs, &c.; treat them kindly, and they will soon cease to fear your presence; do not let a day pass,

if you can help it, without seeing them. There is an old saying, which ought to be impressed on every farmer's memory—it has been of great service to me in the course of my life—it is “The master's eye grazeth the ox.” A friend of mine has lately adopted a plan which, under the same circumstances, I should strongly recommend; it is that of giving a small quantity of oil-cake to animals grazing, for the sake of improving an ordinary pasture, and its effects are astonishing. The pastures I allude to are small, and one or two bullocks more than they are calculated to carry are put into each; the lot are then allowed 4 lbs. of cake per day per head; this, at a cost of about 2s. per head per week—which, I believe, the stock well paid for—has entirely altered the face of pastures from what they were three years ago, when the plan was first adopted by him; and, I believe, without any loss to himself.

I now come to the point of winter feeding. First, as to the places in which they are kept, I unhesitatingly give my opinion in favour of stall-feeding, for all the common purposes of grazing; but not for young beasts that are to be summered again, or for prize oxen: the former should have small well-sheltered yards, with good sheds (if the fences are so high that they cannot see over, it is much better); and the latter, loose boxes, with plenty of room for them to walk about, because they have to be kept up for such a long period, that if no exercise were taken the health might suffer. It is the abuse of stall-feeding that has got it into disrepute with some people, and the not treading down straw enough with others. This last I hold to be an advantage, instead of a disadvantage; for, depend upon it, it is not the size of the dunghill, but the quality of the manure that causes the farmer's stack-yard to be well filled. If managed well, I contend that there is no plan so good as stall-feeding. The fattening-house may be of any size or shape, but it is necessary that there should be underground drains, with gratings, to carry off the urine into the liquid-manure tank; shutters behind the bullocks to regulate the heat, and a wide passage at their heads to feed them and clean their mangers. The advantages I conceive to be the quantity of litter required being smaller, therefore the muck being made better; the temperature being more easily regulated, and every bullock being allowed to eat his share in peace. The disadvantage of the animal not being able to rub himself so well, I consider fully done away with by the rough brush which you will observe I recommend using; and although theorists may fancy the health of the animal likely to suffer, I have never found it so in practice.

Now, with respect to their food, so much does this vary (from the plan pursued by some people with an ox intended to be shown at Smithfield, in a class restricted from corn, cake, pulse, &c. &c., which has the cream from several cows given him, by way of com-

pensation, to that by the man who endeavours to fatten his animals on turnips and barley-straw), that it would take up far too much of the Society's valuable Journal even to enumerate them; I shall therefore simply give the plan I recommend, leaving my readers to follow it if they like, and improve upon it whenever they can.

I think, in many instances, stall-feeding is not commenced early enough in the autumn: as soon as the weather becomes damp, and the days shorten much—say some time in October—the grass in my neighbourhood loses its feeding properties, and then the sooner your bullocks are put up the better; for this purpose I recommend having some of the large, forward descriptions of turnips provided, perhaps the “red tankard,” although watery, and soon becoming of little value, are at this very early season the best of any, from their early maturity; these are sown in April, at the rate of an acre to every eight bullocks, which will last them three or four weeks, according to the crop, and leave a light fold to begin the sheep upon; at the end of which time the forward swedes are ready to begin. During this period I give them little or no oil-cake, if they are only in moderate condition; but they have half a stone of pollard a-day, mixed with an equal quantity of hay or straw-chaff. Some persons may fancy this food is of too loosening a nature, but I can assure them, from several years' experience, that although pollard is loosening itself, yet it has the effect of preventing the watery white turnips from purging too much. Although the bullocks do not gain much in weight during this time, yet I am satisfied they go on faster afterwards; the reason of which, I suspect, is that their bodies are more prepared for the artificial state they have to live in for the next few months. Early in November the food must be changed to swedes, cake, &c.; the quantities of each must vary according to circumstances: the following I consider a good allowance where swedes are not scarce; if they are, more oil-cake must be given instead of a part of them; or, if very plentiful, they may be allowed even more. The morning's bait, 1 bushel of swedes, well cleaned from dirt, and cut small, given a few at a time (I always use Gardner's *sheep turnip-cutter* in preference to any other); then, the refuse pieces being well cleaned out, a dry bait, consisting of 2 lbs. of oil-cake, 3 lbs. of pollard, and a little hay-chaff. While they are feeding, the manure and wet litter must be well cleared away, and any which may be on the bullocks taken off, the floor swept clean, and plenty of fresh litter put in; then have every bullock well brushed with what is called a dandy-brush (being a brush made with whale-bone, for taking the rough dirt off horses). Let not any slovenly farmer fancy this to be a whim of mine; depend upon it the bullocks are kept in much better health and greater comfort for it. They must now be left quiet; they will soon lie down and rest,

and chew the cud till after dinner, when another bushel of swedes is given as before, in small quantities, followed by a similar dry bait of cake, pollard, and hay-chaff, but with the addition of 3 lbs. of bean-meal; this is left with them at night. Be careful that the shutters are opened or closed, according to the weather, so as to maintain an even warm temperature, but not hot enough to make them perspire, if it can be avoided. Be also careful that the mangers are well cleaned out between every bait. I have mine cleaned at the commencement of the season, and as often afterwards as I think necessary, with scalding water and the scrubbing-brush.

After a month or so the cake may be increased; and, if it is thought more convenient, the swedes may be changed for mangold-wurzel. Many persons object to using mangold until the spring: they certainly are more valuable than swedes in the spring, and therefore should always be used last. Never change from mangold-wurzel to swedes after you have once begun them, or the bullocks will not go on so fast; but if, from having a bad crop of swedes, or from any other cause, you want to begin mangold early, you have only to lay them exposed to the air for a week or two to wither, and they may be used as early in the season as is required.

It will be observed that cleanliness, warmth, and quiet are the great points I insist upon; of course coupled with good feeding: but very many tons of oil-cake are annually wasted, because the comfort of the animals is not more attended to. It will also be observed that I have introduced a cheap article of food, which I think does the beasts more good, in proportion to its cost, than anything I give them: I allude to pollard, or millers' offal, as some call it. This I can generally purchase at 4*l.* 15*s.* a ton. I have used it extensively for some years, and like it much; some of my neighbours are now following my example.

Before I conclude I wish to give these recommendations respecting selling the bullocks when fat. Do not determine upon parting with them exactly at any given time; but if a butcher wants to buy a part of them, a few weeks before you think them ready, calculate how they are paying for what they have eaten; and, if you feel satisfied on that head, do not run the hazard of getting a bad sale by refusing a good offer, or perchance the opportunity may not return. Sell them to butchers at home, if you can. Always estimate the weight and value of your bullocks the day before any one is coming to buy them; and, after letting the butcher handle and examine them well, let them out into a yard for him to see; they will always show better than when tied up.

VII.—*On Reclaiming Heath Land.* By JOHN WATSON, jun.,
Land Agent, Kendal, Westmoreland.

PRIZE ESSAY.

THE subject of reclaiming "heath land," or, what is generally termed in the North of England "lingy land," has claimed the attention of our Society: and, when its importance has been considered in connexion with other branches of agricultural improvement, as well as being the first transition of the land from its primitive state, I think it will be at once admitted by all who are anxious for the advancement of our native agriculture to require especial care in the performance, in order to be done economically, and without temporary or permanent injury to the land.

It is true that immense tracts of heath land have been reclaimed within the last eighty or ninety years, a great quantity of which has been notoriously mismanaged, chiefly arising from an utter disregard to anything beyond an immediate profit; and that, in consequence, only a small proportion* of the land in this country remains in its original state; yet we still have in England and Wales upwards of seven millions of acres of unreclaimed wastes and heath-growing land, affording a poor and scanty supply of pasturage to numerous herds of dwarfish cattle and sheep, the growth and development of which are much stunted from the coarseness of their food in particular, and from various other causes incident to lands in a wild, barren, and unreclaimed state: and yet it is no uncommon thing to hear agriculturists scout the idea of reclaiming such lands, and point to some others for examples of the ill effects produced by such a course, overlooking, as such people mostly do, the glaring facts that have brought about such a state of permanent injury.

With reference to those which have yet to be reclaimed, it is to be hoped that greater attention will be paid to permanent benefit than to immediate profit. By the judicious and skilful reclaiming of such, with ordinary attention to after-cultivation, the evils already noticed may be controlled and avoided; the produce may be doubled and trebled both in quantity and quality; and, what is of the utmost importance to this country, a great additional breadth of land might be profitably cultivated for the growth of grain, in order to meet the demands of a rapidly augmenting† population,

* About one-fifth part.

† The rapid strides which agriculturists in general are making in the improvement of the land, and the steadily increasing amount of produce

as well as to afford beneficial employment to the agricultural labourer.

Nor should the general and obvious improvements and advantages in various other respects, consequent on the reclaiming of waste lands and barren heaths, be overlooked: amongst which we may mention the removal, to a very great extent (by judicious and necessary drainage), of noxious vapours, caused by stagnant water on lands of this description, the frequent sources of malignant fevers and other local diseases in low situations—a fact well known to medical men. The additional warmth and shelter also afforded to man and beast, by the enclosure of commons and large tracts of waste land, from the erection of fences and growth of plantations, tend greatly to improve the climate and general aspect of the country; and, as such, may be viewed both as local and national benefits.

These advantages, which I have briefly noticed, being matters of undoubted fact, proved by every-day experience and observation, I beg to recommend them to the serious consideration of those wealthy landowners who cherish a noble and patriotic desire to extend and widen our alimential resources at home, as well as to improve and beautify their native land; who, although they might in some instances lose a few brace of grouse annually by the change, would reap other benefits of a much more substantial and permanent nature.

I will now proceed to state my opinion as to the best method of reclaiming heath or liny land, always keeping in view its permanent improvement on safe and economical principles, with a profitable return for the investment of capital; pecuniary gain, immediate or prospective, being an ever-prevailing epidemic.

Imprimis, let me state that three things ought to be considered in reclaiming heath land: namely, 1st, its present value to its owner or occupier; 2nd, the probable cost of breaking it up and reclaiming it; and, 3rd, whether, after it is reclaimed, the improved value may be expected to remunerate the party for his outlay. These three things ought to be carefully weighed, by a farmer especially, before he commences his operations. But it not unfrequently happens that the owners of heath land expend large sums in reclaiming it, more with a view of beautifying their estates with ornamental plantations, and the like, than of increasing their rent-roll. In such cases, economy, and an adequate return for the capital expended, are seldom taken into account; and, if they were, such operations could not be looked upon as fit examples to present to the general reader.

The system I advocate—namely, paring, burning, and liming—consequent thereon, give me every reason to suppose that the latter will keep pace with the augmenting population of the kingdom.

has been adopted and extensively practised by most landholders in the north of England and borders of Scotland, who have reclaimed large tracts of heath land within the period I have alluded to. My father, who is an extensive farmer and landowner, living at Bolton Park, near Wigton, in Cumberland, whose corroborative testimony I have received in favour of this method in particular, has within the last thirty years, to my own knowledge, reclaimed and brought into a profitable state of cultivation upwards of 2800 acres of various qualities, a great deal of which was not worth more than from 1s. to 3s. per acre to rent previous to its being reclaimed; and some of it even less than these sums. I speak within bounds when I state that the whole of these lands have amply repaid him for reclaiming them, and are more than quadrupled in value, although in many instances imperfectly drained. My father regularly gets from 5 to 8 quarters of oats per acre on his first course of cropping. Oats, in nine cases out of ten, I consider the most suitable as the first crop, and the most profitable also to the farmer, if the altitude of the situation does not forbid their growth. I will now suppose, for example, that I have got a piece of heath land (say 100 acres) to reclaim and divide into suitable enclosures; and, in order to proceed steadily with a little variety of crop, I will break up 10 acres yearly, until I have reclaimed the whole; taking care to begin with the farthest or most inaccessible lot first, so that I may have the benefit of occupying it from as many sides as possible, and over the unbroken ground—an advantage which is sometimes overlooked. This precaution is not always necessary in the vicinity of good roads, but nevertheless ought not to be unheeded. In the first place, after having selected the ground to be broken up, it is desirable to erect a good substantial stone wall or quickset sod fence around the proposed enclosure. If the former be considered more suitable, all stones that are visible upon the land should be grubbed up and carted or conveyed off in sledges; which is expedient for the double purpose of erecting the fence and removing them out of the way of the paring spade and plough. If a sod fence with thorn-quicks is more suitable, I should recommend it in like manner to be made previous to the breaking up of the land, in order that the quicks may be making progress as soon as possible. In either case I prefer having the fences put up, *wholly or in part*, before the plough is brought into operation, as the carting, &c. to the stone fence is much easier performed before the top sward is broken; and a similar remark will generally apply in the case of a sod fence, because the horses, when turning with the plough at the land-ends, break up and trample the top sward in such a manner as to materially injure it for sodding.

The next thing to be done is to drain the enclosure effectually,

if the nature of the ground requires it, previous to paring. If there be a deficiency of stones, a part of the drains might be allowed to remain open or half-finished until after the paring and burning are accomplished, when more will make their appearance. Tile-draining may be resorted to where stones are not sufficiently abundant for the purpose. The ditches along the sod fence will be found serviceable for the purposes of drainage on wet land, and ought to be carefully disposed with that view, not having too much or too little descent; and, during the first course of cropping, all the water which runs down the furrows, or from off the land under tillage, ought, if possible, to be turned upon the contiguous grass lands, by way of irrigation. Great benefit is frequently derived by this course, in consequence of the water carrying off a considerable quantity of lime and ashes in solution. The reason for having the draining done as a preliminary step is to insure the more effectual burning of the parings; for, if the land be springy or generally wet, it is often very difficult to get them burnt, especially in a wet season—a loss that will be visible upon such parts for many years hence, as I shall hereafter notice.

The land having now been prepared for the operation of paring, this part of the work ought to be done, if possible, in the months of April and May, in order to have the benefit of the best and most favourable part of the year for getting the parings well dried for burning, which ought never to be neglected when they are dry enough for the purpose, for the longer they lie after being cut a month or six weeks the worse they are to manage. They soon begin to unite with the ground, imbibing moisture with the young grass vegetating amongst them, which neutralizes the effects of sun and wind. Under such circumstances much extra labour and expense will be incurred; and, even with such, a failure is frequently the result.

The most effectual method of paring is by the “paring spade,” or “pushing spade;” although we sometimes see it done by a light plough, properly rigged for the purpose, and drawn by one horse, in order to save a little time and expense. The latter system may sometimes be advantageously applied to land which has been under the plough; but I prefer the former most decidedly upon all land which has not been under cultivation previously; and I apprehend that I shall be borne out in my preference on this head, for the plough can only be made to supersede the spade upon land of a very even surface and free from stones, with little or no heath upon it—such, for instance, as fine loams or previously cultivated bog earth, where thick parings may be taken with impunity, and no difficulty ever experienced in burning them.

The cost of paring unreclaimed heath land by the spade ranges from 12s. to 16s. per acre; and the burning of the parings in

small heaps (the less* the better) from 2s. 6d. to 3s. 6d. per acre. The burning, as before stated, requires to be carefully attended to, and regularly kept up with as fast as the parings become dry enough. They can sometimes be done with very good effect if set fire to when lying, without having recourse to heaps. I have seen many acres done occasionally in this way in the course of a few hours; but it is a method which requires to be acted upon with caution, and should only be had recourse to on thin black-topped land, where the ashes are usually light and deficient in quantity. Upon such they are frequently so light that they are actually blown away with the wind, and every shower of rain takes a tithe out of them. By igniting them lying they do not get so thoroughly consumed, but quite enough if the heath be entirely destroyed and the parings fully charred. The fire necessarily consumes the liny side which is undermost, *and chars the surface of the soil, which will make ample amends for the deficiency of ashes.* In order to confine the burning by this method to the black-topped parts of the land, where alone it is advisable, a person should go all round them and throw off the parings to one side, for a clear space of five or six feet, to prevent the fire from extending its ravages beyond the prescribed limits, as I do not recommend it on stronger soils where we have a sufficiency of ashes: on such it cannot be advantageously used, the soil and parings being of a very different character; and if tried, the latter will only get singed, as it were, and deprived of the heath which is indispensable to burn them in proper sized heaps. Without it they cannot be effectually burnt nor adequately charred, owing to their more incombustible nature, without having recourse to large heaps and a strong fire—a fault frequently committed. By burning parings in large heaps, where there has been an admixture of clay in them, I have frequently seen lumps turned out of the ash-heaps baked as hard as fire-bricks, owing to the great body of heat required to burn them. Red ashes are produced by a strong fire, and black ashes by slow combustion; the latter are invariably the best, and possess much higher fertilizing qualities, owing, I think, to the great quantity of carbon they contain.

The next step to paring and burning is the liming of the ground, in all ordinary cases where it is possible to obtain it at anything like a reasonable cost, or within a moderate distance. I shall more particularly state my reasons for recommending the general use of lime in a subsequent part of this Essay. The quantity per acre I must in some measure leave to the judgment and discretion of the party using it, which may be varied from about

* Not more than from half a perch to a perch of land ought to be cleared for each heap when the surface is all pared.

150 to 250* bushels per acre, according to the nature of the soil. Strong heavy soils of a sour or rushy nature, containing much fibrous and inert vegetable substance, require more than those of a lighter description; being of a more sluggish and stubborn nature, they require a greater stimulus to arouse them. I have occasionally seen those of a light nature over excited for a grain crop by the too free application of lime, so that the grain was kept in a green and growing state too long, from a continued succession of shoots, thereby preventing its ripening in due season, and giving no return to the farmer, save a quantity of green and bladed straw. However, where a green crop or permanent pasture is more an object of consideration than that of grain, we need apprehend no ultimate harm from a liberal use of it, but quite the reverse.

As soon as the burning of the parings has been accomplished, all stones that have been brought to light should be grubbed up and cleared off as before. These may be used to complete the drains and fences, the forming of roads, or for other purposes; after which the ashes are to be carefully spread over all the ground, taking especial care to clear out the bottoms of the heaps well, particularly the outer circle, where the land is usually charred by the fire—this being an important point to attend to—otherwise the grain will be too gross upon those parts whereon the ash-heaps have been burnt and lain for some time, and the crop will be patchy. Such parts are frequently lodged before the grain gets into ear, and where this occurs it is never well filled.

After the ashes have thus been carefully spread, with the exception of an occasional heap here and there, which may be left to spread upon the space occupied by the lime-heaps, the latter, having been sufficiently slaked, must now undergo the same operation; I would then recommend them to be ploughed in forthwith—in short, as fast as they are spread—so that none of their virtues may be lost by evaporation and exposure to atmospherical influences. If the land is patchy and of different qualities, a portion of the ashes may, with great propriety and good effect, be removed off the best parts and spread over the poorer ones, which will insure a more even crop. If it be stony ground, a person ought to follow the ploughman with a hack, and remove the stones out of his way as they arise or become partly disengaged; for it is very desirable to have the land effectually cleared for the first crop, and *well ploughed*, a task that should only be undertaken by an experienced ploughman.

* A much heavier dressing is often given in the southern counties; but I consider the quantity above mentioned a fair and liberal allowance, and as much as will be found beneficial as a first dressing if the limestone be good.

Contemplating a spring crop, the land ought to be ploughed between Lammas and Martinmas, or as soon after as possible, and allowed to remain in that state over winter. In the spring it will be found well pulverized, from the effects of the frost; and the harrows will perform their work upon it with the very best effect. The additional richness imparted to it by the lime and ashes, and their partial fermentation with the fibrous roots of the heath and other vegetable substances, will render it (to use a homely phrase) "as mellow as a compost midden."

The stones ought to be carted off as they are turned up by the plough; at least, all those which are likely to interfere with the harrows. On cold wet soils the ridges ought to be small (say 6 or 7 times about, or double that number of furrows), observing to plough the land with the most favourable descent for water. On firm dry land they may be made double the size mentioned, or even larger, to suit the fancy or caprice of the farmer; and, if convenient, ought to run north and south, which is most favourable for obtaining an even effect of the sun's rays. If a wheat or other autumn crop is contemplated, the land ought to be ploughed in August, or earlier in most cases. But I apprehend we have not much unreclaimed heath land suitable for the growth of wheat, especially as a first crop. It is generally apt to get too much bladed straw when tried (except upon thin sterile clayey soils), and often gets lodged; which renders the grain very rough in sample, and frequently unsound. The difficulty also of getting the land properly cleared and ploughed in sufficient time, and of getting it to work kindly without the action of a winter's frost upon it, would induce me, in nine cases out of ten, to recommend a spring crop* in preference to an autumn one. I know frequent instances where the land has been pared and burnt early in the spring, and ploughed in time for a crop of oats; but these are isolated cases in favoured situations, principally on dry moss (peaty) earth or loams, where the parings are easily burnt; and such as cannot be held up as general examples, although in some few instances this method may be admitted as proper. The operations being too often performed in such cases in a loose and hurried manner, are seldom succeeded by any real advantage; which a patient, well-regulated, and more systematic course would not more than counterbalance. The liming, stoning, and draining are wholly or in a great measure omitted, the land insufficiently pulverized, and seldom more than half a crop is obtained, in comparison to what might reasonably be expected under the ordinary course of proceeding.

Having now reclaimed the 10-acre plot, so far as preparing it for the reception of the seed for a first crop, the same process may

* Spring-sown.

be applied to the reclaiming of the remaining 90 acres, or to any other extent of ground; observing always to pay attention to its access when selecting the next or any subsequent plot for reclaiming; and, if possible, so to dispose each field that all may have access to water. Some degree of attention must also be paid to the various qualities of the soil, particularly if the field is to be hereafter used for tillage land. In this case it is very desirable to select each successive break as nearly as may be of the same quality throughout. The inconvenience of having three or four different kinds of soil in the same field, requiring as many different kinds of treatment, both as to manuring and cropping, is so well known to the experienced farmer, that it requires no further comment, but to those who have not been in the habit of reclaiming heath land a hint may not be out of season.

I will now proceed to make out a statement of the cost of reclaiming and preparing for a first crop 10 acres of heath land, of an average description, according to the system recommended; and in so doing will adopt what I consider a fair medium, as regards the cost of lime and labour, as well as the nature of the ground:—

	£.	s.	d.
Cost of fencing 65 rods of stone fence (7 yards to the rod) where stones can be conveniently obtained, including stone getting, cartage, &c.	26	0	0
Say 60 rods of drain (7 yards to the rod), either stone or tile-drain, cost of materials, cartage, &c.	5	10	0
Paring 10 acres, at 14s. per acre	7	0	0
Burning ditto, at 3s. per acre	1	10	0
180 imperial bushels of lime per acre, at 3d. per bushel	22	10	0
Cartage of ditto 2 miles, at 1d. per bushel	7	10	0
Spreading lime and ashes, at 4s. per acre	2	0	0
Ploughing 10 acres, at 10s. per acre	5	0	0
Grubbing stones after the plough, and clearing off ditto	2	0	0
New gate, posts, hanging, &c. &c., probably	1	0	0
	<hr/>		
	£80	0	0

It will appear from this statement that the total cost per acre is 8*l.*, which at first sight may to some appear rather heavy; but, when it is taken into account that the land is perfectly and thoroughly reclaimed, and rendered capable of producing two or three successive crops without any additional manure, I think the system recommended will bear a comparison with other methods, which at first sight may appear cheaper and more economical. Setting aside the straw to compensate for seed, harrowing, reaping, and marketing the grain, I have frequently known the first crop of grain do more than pay for the whole outlay, including rent and taxes, which I have omitted to take into the foregoing statement. These, how-

ever, are a mere trifle on unreclaimed heath land. If we estimate the average cost at 12*l*.* per acre, which is a high figure, and suppose that it required a couple of years instead of one to pay for reclaiming the land, surely the improved state of the land, to the extent of three or four times its previous value, ought to be a sufficient inducement for us, in the present state of things, to reclaim all our barren heaths which are capable of so great an amelioration. Some of the estimates given in the tabular statement may be questioned as to their being too low; but they are founded on an average of twenty years, and upwards of 2000 acres of reclaimed heath land. They are also made on the supposition that all the labour is performed by the piece, and not by the occupier of the land, who in most cases would not estimate his labour so high, particularly in reference to horses and carts. The costs of fencing and liming form two very considerable items in the account. By leaving out the former, which in some cases is not required, and in others a temporary fence put up at a light expense is sufficient for the purpose, the cost per acre would fall below 6*l*. The liming appears to cost about 3*l*. per acre. But, viewing this article as an indispensable requisite where it can be conveniently obtained, and one that will amply repay its cost, I shall not attempt any reduction in the average cost on that score. I have estimated the cost of fencing two sides of the enclosure, for it rarely happens that more is required, but frequently less. The cost of a stone wall, and that of a sod fence, quickset and railed, in most cases will amount to nearly the same. In some instances, however, the latter may be made at a lower rate where railing is cheap.

Taking into account the length of time required to rear a quickset or growing fence in some situations, and the labour and attention that must necessarily be bestowed upon it during its growth, I think stone fences are often cheaper in the long run; although the former, in point of appearance, are certainly entitled to the preference when fairly reared. I need scarcely add that, in high climates (say 1000 feet above the level of the sea), it is more than probable that a stone fence will have a decided preference.

The system I have advocated will probably not be found applicable, in all its bearings, to every acre of unreclaimed heath land in this country, which may fairly be considered worth reclaiming, for there are few general rules without some exceptions. I may mention deep boggy ground and peaty earth, which are nearly one and the same thing. These consist of an accumulation of vegetable substances holding water in excess, and sometimes much

* Land may occasionally cost 12*l*. per acre to reclaim it effectually where an extensive and ramified course of drainage is required, but even in such cases the first two crops will frequently cover the outlay.

woody fibre, in various stages of decomposition. Such, I presume, will be included under the head of heath land. The first and most effectual step towards the reclaiming of this kind of land, is to drain effectually; and if the land does not collapse, but becomes sufficiently firm after drainage to bear the weight of horses and carts upon it, then to have recourse to repeated diggings,* by courses, in order to remove the superabundant bog earth. I have seen bog earth of considerable depth, which would not bear the weight of cattle upon it, reduced to within two or three feet of the substratum of clay by this method. When dug up, the pieces were thrown into oblong heaps or wind-rows, and set fire to as soon as they were dry enough to burn. Course after course was continued in this manner,—digging and burning, always changing the position of the wind-rows in each successive course, until a sufficient quantity of the superfluous bog earth was consumed. Much of Chat Moss, through which the Manchester and Liverpool Railway passes, I understand, has been reclaimed in this way. However, where peats are a saleable article, and the bog earth of that description, such land may be turned to a more profitable account. Peat bog in this neighbourhood is frequently sold at the rate of 30*l.* or 40*l.* per acre; and the land, when thus cleared of the superfluous bog earth, will realize as much more. Marl or clay, road scrapings, sand and gravel, are the best manures for this kind of land. The lighter descriptions of bog earth especially require a good dressing of clay or marl, in order to weight them and give them due consistence; as well as to regulate their powers of absorption and evaporation. I must make an exception on this kind of land in reference to the application of quick lime, which only tends to accelerate its too rapid decomposition, and to give it additional lightness,—a property which it already possesses in too high a degree; and give my opinion in favour of good shell marl or clay in preference to any other manure; which, when judiciously and properly applied, forms a ready combination of the two extremes of soil, and contributes to its density. Quick lime is too powerful and barmy in its effects upon such lands; but mild lime, as marl, clay, and the like, tend greatly to improve the physical and chemical properties of the soil; and, when judiciously applied, render it the most productive of all soils.

The variations of cost in reclaiming land of this nature are of so wide a range, that it is impossible to fix any regular amount; as that must depend upon the extent of drainage required, and, if any, the depth of bog earth required to be removed, and the facilities afforded for procuring marl or clay. I may likewise add,

* A good dressing of clay will sometimes answer the purpose, without adopting this expensive method.

the value to be attached to peats. It requires no remarks, on the other hand, to point out the method of cutting and getting peats, or disposing of them to the best advantage; as this must depend upon their quality, and the demand for them in the neighbourhood. I would, however, warn those who possess this kind of land against the too frequent practice of reducing the bog earth too low, and of leaving little for after cultivation, save a bare and unproductive substratum of poor clay, inducing the growth of toad-pipes and coltsfoot. The quantity left will always diminish after drainage, to a considerable extent, from the decay of vegetable matter of which it is composed; as well as from the shrinking of its fungous bulk, by the withdrawal of the water and subsequent condensation.

Some bog land, however, may be reclaimed by thorough drainage, which will render it sufficiently firm to bear the weight of horses and carts, without having recourse to more than the ordinary method of paring and burning. Where we find a surface layer of "white moss," or, as others term it, "grey moss," it is indispensable to have it removed, before the land will become fertile.

Well condensed black earth, blended with, and partly associated with loam, may be greatly improved by a dressing of quick lime on the surface, without paring, burning, or otherwise breaking the top sward, which will often destroy the heath most effectually, and raise up a luxuriant green herbage in its place; thereby rendering the use of the plough and paring spade quite unnecessary, where permanent pasturage is the object desired; as is frequently the case in high situations, unadapted for the growth of grain or general husbandry.

Having thus far extended my observations to that description and quality of heath land, which, under our present scope of agricultural knowledge, may reasonably be deemed capable of amelioration to that extent which would justify us in reclaiming it, I shall briefly notice our scowling cliffs and lofty mountains. These embrace a large* portion of our unreclaimed heaths; and, although we occasionally see improvements carried far up the slopes of mountain sides, yet, in this respect, there is still a wide field for extending our operations in very many localities, where improvements might be pushed with safety and profit far beyond their present sphere. Were these carried out to their fullest extent, we should still have many thousands of acres of cloud-capped hills, that set at defiance the art and energies of the British farmer. Even the sturdy yeoman of the north, whose daring spirit and brawny arm have shorn Nature of many of her savage features, is compelled to acknowledge her sovereign rule, and to allow her to

* Nearly one-half.

reign on in undisturbed possession of these elevated hills in all their primitive wildness, without a probability of ever being called upon or compelled to dispute her authority. In this state they are likely to remain, except where, here and there, in some sheltered nook, a few acres may be nibbled out by some enterprising workman; who, by dint of hack and spade, will often surmount great obstacles.

That the act of reclaiming must have its limits in mountainous districts no one will attempt to dispute. Beyond this limit, which cannot be definitely fixed, the only improvement or good which can be effected appears to me to be that of surface drainage, and of rearing woods and plantations. These will thrive at several hundred feet higher than any crops of an agricultural character, if planted in sufficiently large tracts. I am persuaded that great benefit is derived from plantations, in high climates, by contiguous lands; from the warmth and shelter afforded during more than one half of the year, not only to cattle, but also to herbage. Shelter and warmth are as indispensable to neat cattle as to the human race.

I have no doubt my opinion will be questioned as to the propriety and prudence of paring and burning upon thin soils, and not without some show of reason; but I wish my readers to understand that, where I come upon soils of this description *with a green sward of thin texture*, I do not class them as "heath land." Such may be unreclaimed virgin soils, certainly, but ought not to be confounded with the former; although we frequently see them blended together in such a manner as to render their separation a matter of difficulty. Where the plough can be brought to work effectually upon such of this nature as possess a delicate and thin top sward, with little vegetable root and no heath upon them, I need scarcely add, that economy alone will point out the expedience of dispensing with the paring spade. As regards *heath-growing land* of this description the case, however, is very different; and paring and burning cannot be prudently dispensed with, for the purpose of getting rid of the heath: without which, it is impossible to get a crop worth having, or even to get the land half ploughed. I have seen such land *horse * pared* (without burning), limed and ploughed, and ploughed again and again for the first crop. Yes, I have repeatedly seen this method tried with the view of preserving all the vegetable mould, as I was informed; and the invariable result has been a return of little more than the seed sown for the first and second crops: and, in after years, I never could discover, where this mode had been acted upon, that the land was more productive than other fields of similar quality which had been pared and burnt. The ashes, scanty though they may be on such land,

* Done with a light plough drawn by one horse.

are of paramount importance for raising the first and second crops. Without their assistance little produce can be obtained; and the difficulty of ploughing down the heath, and getting rid of it, renders the system of paring and burning doubly advisable. The only objection worthy of consideration that I have ever heard raised against paring and burning the surface of the soil in reclaiming heath land is, that "it permanently reduces the stamina or constitution of thin soils." To this opinion I demur. I admit that to a trifling extent it reduces* the vegetable mould; but, in return for this reduction, we receive an active and enriching manure in the ashes. These ashes are of more value than the substance from which they were made. With them the finest crops may be procured on nearly all inferior soils, which would not for several years produce them without ashes, or some other substitute. These crops will enable the farmer to return a supply of good manure to the land from which it is derived: and if, in ten years afterwards, his land is not found in as good a state as his neighbour's, who has reclaimed his land without paring and burning; and if he has not also received a better return for his outlay, then I will succumb, provided they both do justice to their land in the intermediate time, and are upon equal footing as to the quality of the land. A quick and sure return for the outlay of capital, is what the farmer must and will look to; and to this no reasonable landlord will object, provided it can be obtained without inflicting an injury either temporary or permanent upon the land. It should never be forgotten that the real incentive to improvements lies in the certainty of a quick and adequate return for the capital ventured. This is the "philosopher's stone," and the mainspring to all our exertions. Paring and burning heath land, with a proper dressing of lime, will give to the farmer as much produce in three years as any other method I have ever seen tried will give in four. "Hope deferred makes the heart sick;" and no sensible man will wait four years for that which he can get in three.

In addition to other benefits derived from paring and burning the surface, it exterminates the slugs and the eggs of insects, which abound in the turf; and destroys the seeds and roots of injurious plants.

Where the heath is very strong it is frequently set fire to and burnt previous to paring, from the difficulty experienced in dis-

* This reduction is only temporary, and is soon compensated by returning the whole of the produce to the land after being converted into manure. A similar reduction, although by a slower process, will be the result without paring and burning, if a compensating return is not made to the land. I submit, therefore, that paring and burning the surface is a method of reclaiming heath land at once safe, economical, and expeditious; and that the improvement or deterioration of the land depends altogether upon its subsequent management and prudent husbandry.

engaging it with the paring spade from the uncut sward, when tilting over the parings as they are cut. But this should only be allowed as an act of necessity, as it deprives the parings of their inflammable parts, and makes them difficult to burn afterwards. It is often accompanied with danger also, which it is prudent to avoid, and should only be applied to isolated patches.

On thin soils I recommend thin paring. Thick paring should only be resorted to on superabundant bog earth, or on sour rushy spongy lands, where we have a great amount of vegetable and fibrous root. I consider the ashes upon very thin soils, where many people would question the propriety of paring and burning, a positive benefit, instead of an ultimate injury, which is frequently apprehended. I have seen many convincing proofs to strengthen me in this opinion. Without being tedious, I trust I may take the liberty of giving one instance as an example.

About eighteen years ago, my father reclaimed a plot of thin cold-bottomed heath land, containing about twenty acres. The season was a wet and unfavourable one for burning parings; and, in consequence, a few patches in several parts of the field could not be burnt, or at least were not burnt—in all about four acres. An additional quantity of lime was put upon these patches, with the view of compensating for the want of ashes; the parings were turned down, and great pains taken in getting them well ploughed in. Two crops of oats were taken off the field in succession, and afterwards a crop of turnips, which were consumed on the land by sheep. In the following year the land was sown down in oats, with a good variety of grass and clover seeds. Amongst all these several crops of oats, turnips, and grass seeds, any person, on looking at the field, might have told to a yard the patches whereon the parings had not been burnt; the produce being so much inferior to the rest of the field, even with the additional quantity of lime, which did not supply the defect. The land was all of the same quality, so that the difference could not be attributed to that cause; but afforded a decisive proof that the ashes were of much more value than the unconverted substance from which they were made; and a still further proof was that, for several years afterwards, when the land was in pasturage, these dark, inert, and unproductive patches might still have been traced out. I could point out many other instances of a similar kind; some, where the parings were carted off into large heaps, and made into compost with a sufficiency of quick lime, and afterwards recarted to the parts in that state, with little better effect. Such proofs as these have convinced me of the extraordinary fertility of ashes made from turf; and also that the system of paring and burning the surface in reclaiming heath land may be safely adopted, not only without temporary or permanent injury to the land, but even to

its permanent benefit; and both with immediate and ultimate advantage to the farmer. However, let it be distinctly understood that I should object to a repetition of the practice on all thin soils. On deep clay lands, or where we have an excess of vegetable substance, it might be repeated with safety and advantage. It renders the former more friable and porous, and relieves the latter of its superfluities.

The great advantage of having lime at a moderate cost need scarcely be alluded to. In this respect the formation of railways through all parts of the kingdom must prove highly beneficial to those who are convinced of its invaluable properties. Doctors, however, differ in their opinions, and so it must ever be with agriculturists, on some points. The opinions of the latter as to the properties of lime, and the benefit to be derived from its application, are very conflicting; and even the most eminent chemists are far from being agreed upon its value and effects. Every man, therefore, who has given it a fair trial may be justified in forming his own judgment on its merits; and, so far as my experience leads me to judge, I must confess that I consider it *invaluable as a first dressing in the reclaiming of heath land*. There are many inert properties in virgin soils which without its application might lie dormant for ages. "Fossil manures must produce their effect, either by becoming an elemental part of the plant, or by acting upon its necessary food, and rendering it more active and agreeable for the purposes of vegetable life." Such is good lime when judiciously applied. It acts as a powerful stimulant upon inert substances; and, being an antacid, decomposes and corrects the crude and acrid matter arising from the decay of organic bodies in virgin soils, assimilating their component parts, and thus calling into vigorous action the dormant powers of the soil; in short, I consider it of incalculable benefit on all virgin soils with which I am acquainted, immediately or ultimately, when judiciously applied, either in the mild or caustic state. Observation has convinced me in some instances that it will continue to operate for fifteen or twenty years, where there is an excess of inert vegetable matter in the soil. I know a plot of ground in this neighbourhood, containing 166 acres, which formerly grew little except heath. A good dressing of lime was applied on the top sward, which has more than doubled its value. This was done about fifteen years ago, and totally eradicated the heath. The lime to this day appears in full action, as its effects annually testify, from the richness and sweetness of the herbage, the texture of which has been thoroughly changed by the application of the lime. The deep green hue and luxuriant appearance of this land in spring and autumn form a striking contrast with those adjoining, which are still unimproved. The soil is a thin moorish loam in a

high climate, resting on the greywacke formation. I have seen much valuable produce lost from the omission of lime in the primary act of reclaiming heath land, one instance of which I give as an example:—A farmer well known to me, who had a large plot of unreclaimed heath land, and who had only three years of his lease unexpired, having received notice to quit at the end of his term, thought he would break up this piece by paring and burning. Liming, however, he thought must be dispensed with, as he calculated that in two crops he could not possibly get repaid for such an outlay. It so happened that in this large plot there were a few patches of impoverished land, from which nearly the whole of the vegetable turf had been cut and carried away by a former tenant. These parts were considered so much reduced that it would be impossible to raise a crop upon them without a small quantity of lime, in addition to the sprinkling of ashes, which was therefore applied as an act of necessity. The consequence was, that these very inferior patches produced double the quantity of grain and straw to any other portion of the field when in crop; and in after years the herbage was much more luxuriant and of finer texture. I am satisfied that, if in this case 150 or 200 bushels of lime per acre had been applied, the cost of which including cartage would not have exceeded so many groats, an adequate return at least would have been the result in the first crop.

The importance of thorough draining, which is too little understood, and much less practised in many districts where great facilities are offered, is a subject I cannot pass over unnoticed. Thousands and tens of thousands of acres in this country are scarcely producing one half of what they are capable of doing, owing to such neglect; and, in many cases, are to be found in a worse plight than when in an unreclaimed state. I cannot consider such lands reclaimed, although they have been made subservient to the plough, when this most important requisite has been omitted. I would, therefore, humbly but earnestly impress upon all the absolute necessity of thorough draining, as a primary and most important act in the reclaiming of heath land; for, without its performance where required, the act of reclaiming will be a farce; the land will slowly but surely retrograde to its former state, or something worse (unless repeatedly and heavily manured, which will disappear almost as fast as applied), and all our boasted improvements will be visions of a brief and transitory nature.

Before I close this subject of inquiry in reference to the act of reclaiming, there is one description of heath land hitherto unnoticed which I ought not to pass over without a few remarks. I allude to broken and craggy ground, which in many parts of Westmoreland and Cumberland is of considerable extent. To

effect a thorough reformation of such is in all cases very expensive when practicable, and in others utterly impracticable except by planting. It is impossible on such land to say that any fixed rules could be laid down beyond the simple fact that, where paring is impracticable, there appears only one way of assailing it, and that is by trenching. In other words, to hack, dig, trench, and hew away as well as you can, making use of the stones for fences, drains and roads, or otherwise stacking them up in corners, or upon the worst parts of the land; and nibbling out all and every patch that is considered worth the labour, up to the very teeth of the hard and sturdy grey clints, which may be left to take care of themselves. The expense of reclaiming such land is often more than the value after its redemption. Many of the small land-owners, living upon their paternal estates in the counties of Cumberland and Westmoreland, and the West Riding of Yorkshire, having large families, with little employment for them one half of the year, are in the habit of redeeming small patches of craggy ground from off their larger sheep walks. These are chiefly in the mountainous districts; and if you were to reason with them as to the cost, their answer would be, that "they might as well be improving their estates as sitting by the fire." In such cases they set down their labour at nothing, so long as there is nothing to pay. Apart from the method described, a dressing of lime upon such land is the only profitable way of improving it for pasturage by destroying the heath; but it will not in many instances effect a radical cure in that respect, although it seldom fails to improve the herbage. The highly popular and valuable manure guano appears to me to be just the sort of thing that is wanted in hilly and mountainous districts. What effect it would produce upon heath land I am not prepared to say, never having given it a trial. Its cheapness and portability certainly have strong claims upon our consideration, and I have little doubt but it would materially improve the herbage.

Having discussed the system of redeeming heath land so far as relates to its capabilities of amelioration, I will now proceed to offer a few observations *on the course of cropping* on such lands as are adapted for the growth of corn, and also on the *conversion into pasture of such, as from the steepness of the land, or its elevation above the level of the sea, are unadapted for the culture of grain or general husbandry.*

The course of cropping, which comes next under notice, certainly offers a wide field for discussion; and I am fully convinced that any theoretic* rules which can be given in a book must fall

* Although many farmers are apt to look upon theoretic rules with suspicion and contempt, I think no person is sufficiently and properly qualified for the management of a farm who does not possess a theoretic knowledge

far short of general application, and must always be taken with some degree of allowance. It would be no difficult task to lay down the best and most approved modes of culture for particular localities, possessing an uniformity of soil and climate; but when we consider for one moment that one of the first agriculturists of the present day (Mr. Morton) has classified thirty-six different varieties of soil in South Britain, admitting, as they must of necessity do, of various degrees of intermixtures and incongruities, the task can only be accomplished by going at once to generalities. The varieties of climate, soil and its properties, situation in reference to markets, and various other circumstances of a local character, must and will influence very materially the course of cropping in every district, which possesses any peculiar feature dissimilar to that of others. Under the circumstances detailed, the prudent farmer will select that sort of crop and course of cropping which are most in accordance with his views of good husbandry, and likewise most profitable to himself. Albeit, taking a general view of the unreclaimed heath lands of this country capable of tillage husbandry or corn culture, we shall find that the greatest amount consists of cold, thin, and inferior soils in endless variety, chiefly in the vicinities of the mountain ranges, and partaking more or less of their nature and properties as regards their soil and the formations upon which they rest. The alternate system of cropping is now so universally admitted as the basis of good husbandry, that I shall recommend it as a standard rule to keep in view. By the alternate system, I mean a green crop between two white ones. Two white crops in succession may be admitted, or rather, I ought to say tolerated, on virgin soils well limed, and of pretty fair quality; but one is safer, succeeded by a green crop. As I have before stated in reference to grain, in nine cases out of ten I consider a crop of oats* the safest to commence with, because there is frequently a great deal of rough straw as well as grain at first, and consequently great irregularity and unevenness in the sample, which will be less objectionable in oats than in wheat or barley. In addition to which oat straw is more valuable; and, if cut rather fresh, as it ought to be in all cases, it makes excellent fodder with a proper allowance of turnips, much better than that of wheat or barley,

of husbandry in addition to a practical one, notwithstanding the latter may be of greater import. There is nothing like system in all things, and sound theory is neither more nor less than well-regulated practice systematically arranged.

* A green crop when desired, and not allowed to seed, may be taken first; for it is never objectionable if the land be suitable. Peas and beans run too much to straw on new land *invariably*. However promising they may appear in their early stages, they seldom fail to disappoint the expectations of the farmer as to their yielding.

which are seldom fit for anything but litter or thatch. Therefore, admitting the alternate system of cropping to be good both in theory and practice, the second crop ought to be turnips, cole, rye, clover, vetches, or other green crop. If the land be too rotten or wet to consume green crops upon it with sheep, it will be advisable to adopt such of the above as may be cut green for stalling. I would rather see two green crops taken in succession than two white ones; but how very few converts I shall make by this avowal! Potatoes should never be grown upon new land for the table; but for seed I should prefer them to any other, as they are invariably strong and healthy. For the third crop I should recommend barley or oats, and the land sown down to grass, which in the following season ought to be pastured, and not mown as hay, if we desire a good sward as the reward of our management. If the land be in high condition, the grain is apt to injure the grass seeds by getting lodged. To obviate this, instead of sowing the grass seeds with oats or barley, I should rather sow them with a crop of cole, to be eaten off with sheep. Many farmers would grumble at this, thinking that they were losing a good crop of corn; but I have seen the most luxuriant pasture obtained by this method; and I never saw a farmer who tried it, however reluctantly, that ever regretted having done so. So very much depends upon the nature of the soil, climate, and other circumstances, that I think it would only tend to weary the reader were I to pursue the inquiry further in reference to the course of cropping upon lands adapted for the culture of corn and grain, being convinced that it would be presumptuous to offer any determinate rule as a universal panacea.

All lands* which, by reason of their great elevation above the level of the sea or steepness, will not admit of corn culture, must

* All lands in England and Wales at an elevation of 1000 feet above the level of the sea, whatever may be their qualities in regard to the nature of the soil, are too high for arable culture. In some districts, however, we find as good crops produced, and the harvest as early at an elevation of 800 feet, as in others at 300 feet lower. Local circumstances have a great tendency to alter the climate, as well as the period of ripening of grain. Poor clay-soils on a cold-bottomed retentive subsoil, and northern aspect, are much later than those of a light, dry, sandy, gravelly, rubbly nature, on a rocky or porous subsoil, with a southern aspect and a good inclination, approaching to a right angle with the sun at midday. Large tracts of undrained land, unreclaimed heaths, forests, lakes, mountains, and morasses, all have a great tendency to attract moisture, and decrease the temperature of the district; whilst, on the other hand, a well-cultivated and well-drained district has the opposite effect. Moisture attracts moisture, and water attracts water. How much then might be done to improve the climate of this country, were a complete and thorough drainage effected of all the waste lands, in addition to what is steadily going on in cultivated districts! The effect of such a state of things may be readily imagined by those who have studied the laws of nature.

and ever will present a formidable barrier to their amelioration in consequence, except what may be derived by drainage and the application of lime as a top-dressing. I have seen a great deal of land of this nature reclaimed, where, after paring, burning, and liming, the farmer has been tempted to risk a crop of oats; plenty of straw succeeded, and, *occasionally in a favourable season*, a moderate return of oats. All succulent plants, as turnips, cole, and vegetables in general, grow and thrive well in a humid climate, provided the land be dry and of fair quality, fresh and in good heart. But the great objection in such situations is that they are generally too high, cold and exposed, for feeding off sheep in the autumn or depth of winter upon turnips or cole, and that sheep seldom come off any better than when they were put on. These obstacles, however, might be overcome by sowing the cole early in the spring, instead of waiting until the middle of summer or later, as is too often the case. Another method also may be tried, which I have seen answer very well, namely, a thin sowing of barley or rye, which may be stocked and eaten off with sheep, when about 5 or 6 inches high. Both these are excellent methods of sowing down to grass, the seeds being much less injured in this way than by a crop of corn. I am supposing that under the circumstances detailed the land is capable of being ploughed.

The best method I have ever seen adopted in laying down newly-redeemed heath land to permanent pasture is to sow the grass seeds and clover alone, without any other kind of crop; then we are sure of a good and luxuriant braid. This plan is far too seldom adopted for fear of losing a crop of corn or cole. Whatever kind of crop or course of cropping may have preceded, it will make no difference as to this recommendation, provided the land is clean and well pulverized. It is seldom desirable to sow the land down to grass before the third year, which affords a better security against the revegetation of the heath than if sown down the second year. Where permanent pasturage is the grand object in view, there is no good policy in deep ploughing before the last course. The principal thing seems to be how to get a good braid of grass, and how to keep it from year to year. Supposing that the land has been pared and burned, and one, two, or three crops taken before sowing down, I should recommend shallow ploughing until the last course, which ought to be an inch or two deeper. This will raise to the surface all the lime and ashes or other manures which remain unexhausted in the land, as well as a small portion of fresh soil; the tendency of all manures not volatile being obviously to settle downwards. This will afford a rich store of food for the young grasses, their nutriment being derived principally within a few inches of the surface.

In respect of those lands which by reason of their steepness cannot be ploughed, I have but few observations to offer. Draining, liming, or planting, appear to be the only resources which we can profitably employ for their amelioration. I have seen paring and burning, with a good application of lime, tried, but do not approve of it. The slippery state of the surface after paring, combined with its steepness, enable every shower of rain to wash away a considerable portion of the lime and ashes. Besides these objections, paring and burning will not always eradicate the heath without having recourse to the plough also.

In laying down heath land to permanent pasture, I would always suggest that a good selection and variety of clovers and grass seeds should be sown, more particularly of those natural grasses which are most congenial to the soil and climate.

It is a lamentable but a notorious fact, that much more harm is frequently done to redeemed heath land by over-cropping and over-stocking afterwards, than by any of the usual methods adopted in the primary act of reclaiming. Farmers in general are too apt to plough and rake away at the land so long as it is in high condition and produces a crop of any description, never looking beyond their immediate profit. They scour away at it as though it could never be exhausted; take two or three white crops in succession without returning back to the land the manure created by it. Sometimes a green crop, which is drawn, succeeds a host of white ones; then another white crop, and sometimes two. The land is at length sown down with grass seeds, which are mown the following year; and then, without allowing the land breathing time, the plough is again stuck in, and another scouring routine of cropping pursued similar to that detailed until the virility of the land is so far exhausted as to be almost if not quite beyond recovery. Some of my readers may consider this an overdrawn picture; but I assure them I have not unfrequently witnessed such facts. It is too commonly done on inferior lands difficult of access, to which my observations are principally directed, and which constitute the great bulk of recently reclaimed heath land; good land possessing in itself a reactive and reproductive power; or, in other words, an intrinsic value, which requires little more than fair play and ordinary attention to keep it fertile. Too much ought never to be exacted from lands of a weak constitution. Whatever is taken from them in the shape of produce ought invariably to be returned in the shape of manure. To build up and never to pull down is a maxim that ought always to be kept steadily in view. Like a delicate constitutioned man or beast, they ought to be well fed and supported, and never overworked; exercised and taxed in moderation, seasonably and regularly, but never beyond their powers. Adhering to these principles, we may safely

and surely hope for their progressive amelioration and permanent improvement.

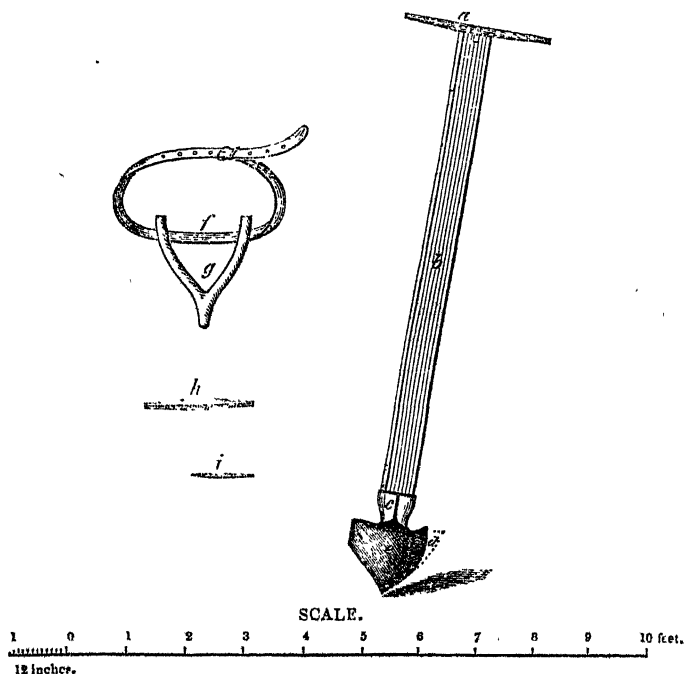
The next and concluding observation I have to make is with regard to overstocking. It is a very common error, and one which at least one half of our farmers are in the habit of committing. In the winter season especially all newly-reclaimed heath land should be left with a good covering of grass upon it, in order to protect it from the influences of the weather. Deprived of the heath, its natural covering, it necessarily, to use a common expression, "gets starved," and requires a substitute if eaten too close in the autumn or commencement of winter. When this is the case, Nature steps in with her mantle of moss to supply the defect. In each succeeding year the same error is committed, the herbage degenerates both in quantity and quality; an annual unceasing contest is maintained between the moss and the grass, each struggling for the ascendancy; and man, from short-sighted views of economy, insensibly assists the former until nature gradually turns the balance, and thus completes the victory. Whereas, had an opposite and more sensible course been pursued, by keeping always a good coat of herbage upon the land, and thus protecting it through the inclemency of winter, the cattle, though *possibly* fewer in number, would have been better fed, the top sward would have been considerably thickened, and a vigorous braid of grass, at least a fortnight earlier in the spring, when it is most valuable, would have been the result.

I have now to apologise for having introduced anything into this treatise which the scientific or practical reader may consider extraneous to the subject, or for making any omissions of what would have thrown additional light upon it. My object has been to present the reader with as much practical information as I could well compress together in a short compass, leaving out chemical and geological remarks, with their technical phraseologies, which are little understood by the generality of farmers. The importance and value of this learning, however, I am bound to acknowledge, in order to arrive at a proper application of manures to soils of various compositions.

In advocating what I consider the best system or systems of reclaiming heath land, it has been my chief object to keep in view an efficient method combined with economy—a quick and adequate return for the outlay of capital, not only without inflicting either a temporary or permanent injury upon the land; but, on the contrary, by a steady, safe, and prudent course of management, to promote its progressive and permanent improvement: and I hope the time is not far distant when many of our barren heaths will be made fruitful by judicious and skilful management through the more extensive diffusion of agricultural science, which

of late years has made such rapid progress under the stimulus afforded by agricultural societies, the competition for whose prizes has diffused a spirit of emulation unparalleled in our history.

PARING SPADE AND TRAPPING.



- a. Handle of the spade $2\frac{1}{2}$ feet long, diameter $1\frac{1}{2}$ in., made of wood.
- b. Shaft do. 8 feet long, 6 in. wide, $1\frac{1}{2}$ in. thick, made of wood.
- c. Socket for the shaft, cut out of the spade plate and turned up.
- d. Lug, or wing, cutting upwards similar to the coulter of a plough, turned up 5 in.
- e. Spade, cutting horizontally, 15 in. by 13 in., well-tempered steel.
- f. Strap to buckle round the body, and hold up the knocker in front of the thighs.
- g. Knocker to push with, and protect the person from injury (forked piece of wood).
- h. Rough whetstone for giving a rough edge.
- i. Smooth do. for giving a fine edge.

The rapidity with which capital accumulates in this country necessarily suggests to its possessors a desire to invest it advantageously. In the improvement of the land there is ample scope. The produce and value might in thousands of instances be doubled and trebled if skill and capital were only applied even in land considered as already reclaimed, which, from want of thorough drainage and proper management, is almost worthless in its present state.

The great number of farmers and agricultural labourers who

emigrate annually to seek a livelihood in foreign climes and far distant colonies, driven through dire compulsion to rend asunder the strongest ties of affection, and abandon for ever their native land, cannot be viewed without feelings of regret by all right-thinking men : and yet how much of this might be obviated if our wealthy landowners would set about improving their estates by drainage and the reclaiming of extensive heaths, (instead of squandering their time and capital on the Continent,) thereby enhancing the value of our country by increasing its produce and general fertility—providing additional supplies of home-grown food for the millions—diffusing peace and plenty around the cottage hearth by furthering and extending the happy means of employment here pointed out, and searching out the hidden treasures of the soil ! Such objects as these are well worthy the highest ambition of every true patriot, who will ever regret to see those who on all occasions have been found as ready and well qualified to wield the sword in war as the ploughshare in peace, thus reluctantly estranged from the land of their birth.

February 22, 1845.

VIII.—*A detailed Account of the Making of Cheshire Cheese.* By
HENRY WHITE, Land Agent and Surveyor, Warrington.

PRIZE ESSAY.

IT has sometimes been a matter of dispute amongst Englishmen which particular county or district is the most famous for the making of cheese. I think, if quantity is to be taken into account as well as quality, the decision must be in favour of Cheshire, as there cannot be less, upon a moderate calculation, than 12,000 tons made in that county annually ; a considerable portion of which is of excellent quality.

There is reason for believing that cheese has been made in Cheshire for at least 700 years :* and, from allusions made to

* "The fame of the cheeses of Cheshire is of very ancient date: at least as old as the reign of Henry I. (A.D. 1100). The Countess Constance of Chester, though the wife of Hugh Lupus, the king's first cousin, kept a herd of kine, and made good cheeses, three of which she presented to the Archbishop of Canterbury. Giraldus Cambrensis bears honourable testimony to the excellence of the Cheshire cheeses of the day." (*Bell's Weekly Messenger*, Feb. 22, 1841.) "Poor men eat cheese for hunger, rich for digestion. It seems that the ancient British had no skill in the making thereof, till taught by the Romans, and now the Romans may even learn of us more exactness therein. The county of Chester doth afford the best for quantity and quality; and yet their cows are not (as in other shires) housed in the winter; so that it may seem strange, that the hardest kine should yield the tenderest cheese. Some essayed in vain to make the like

cheese and to curd in the Old Testament,* it is evident that an article of this nature must have been known and used at a very early period.

It is scarcely necessary to premise that milk, from which cheese is made, consists of three distinct parts—*cream*, *curd*, and *whey*—into which, by repose, it spontaneously separates; but the process of separating the whey from the other bodies may, as in cheese-making, be accelerated by infusing a small quantity of a simple acid extracted from cured and dried maw-skins,† which have been previously dissolved in warm water. This infusion is commonly called “steep,” but more properly *rennet*.

The art of cheese-making consists in the complete extraction of the whey and in the proper compacting and curing of the curd. The richness of the cheese depends upon the quality of the milk, or, in other words, on the proportion of cream which the milk contains. The cheese of Cheshire is professedly made from new milk, or milk from which no cream has been taken. It is, however, well known, that in many dairies, in the morning before cheese-making, a small quantity of cream is skimmed off the previous evening's milk; this cream is either churned by itself, or mixed with whey-cream, by which there is obtained a better quality and greater quantity of (so called) whey-butter. It may appear singular to some, that any portion of cream should be found in whey, but such is the fact, and the means used in Cheshire for extracting it are very simple (see *Appendix*).

Before entering into a detailed description of the mode employed in Cheshire in the making of cheese, I would remark that this Essay is founded upon my own observations, made during a fifteen years' residence in, and intimate connexion with, that county; which latter is still existing. I have long felt an interest in the subject of cheese-making, with a desire to see it conducted upon more scientific principles, from a conviction that, were such the case, both the pocket of the producer and the stomach of the consumer would often be more agreeably filled: but I do not wish it to be supposed from this remark that I profess myself conversant with these principles: my information being more of a practical nature, and as such I offer it to the Society.

in other places, though hence they fetched both their kine and dairy-maids. It seems they should have fetched their ground too (wherein surely some occult excellency in this kind), or else so good cheese will not be made. I hear not the like commendation of the butter in this county; and perchance these two commodities are like stars of a different horizon, so that the elevation of the one to eminency is the depression of the other.” (*Fuller's Worthies*.)

* 1 Sam. xvii. 18; 2 Sam. xvii. 29; Job x. 10.

† The *stomachs of sucking calves*. See the method of curing these in the *Appendix*.

Number of Cows kept, and Produce.—The number of cows kept for the purposes of a cheese *dairy* is seldom less than 8 or 10, or more than 70 or 80; and is of course regulated by the size of the farms—these average about 90 or 100 statute acres, upon each of which about 15 or 18 cows are kept. From 18 cows, a cheese of from 36 lbs. to 54 lbs. weight is made daily during four or five months of the summer.* The annual produce of cheese per cow depends both upon the quality of the animal (with the mode of keeping her) and of the *land*, or rather the *herbage*. I have known many farmers sustain great loss by not feeding their cattle sufficiently well in winter. With judicious management, about 3 cwt. of cheese (of 112 lbs.) may be considered as the average amount made per annum upon land let for 30s. a statute acre; but in a few instances 5 cwt. per cow, and even more, is sometimes made. This can only be from a small and choice stock.

The Season.—It is the practice amongst farmers in this county to arrange so as to have most of their cows calving in the months of March and April; and so soon as the calves are fed or disposed of, the cheese-making commences, and continues (excepting in small dairies) to nearly the end of the year. In January and February the quantity of milk obtained is often so small that the farmer prefers selling it in the neighbouring towns or making it into butter. There are however instances, in large dairies (of 70 or 80 cows), of cheese being made throughout the year.

Milking.—The operation commences about five o'clock in the morning, and five or six in the evening. In this county it is the practice for most of the servants, both men and maids, to assist, and for the cows to be milked in the cowhouses (called here "shippons") all the year round. When, as is usual, there is one milker for every six or seven cows, the milking seldom exceeds an hour and a quarter.

The milk of new-calved cows is not mixed with the other until about four or five days after calving.

Offices and Utensils.—As the evening's milk is seldom made into cheese until the following morning, and sometimes in small dairies (where four "meals" are used) not until the second morning, a cool "milk-house" is necessary; on which account it usually occupies that side of the farm-house least exposed to the sun. The utensils in which the milk is kept are usually portable shallow earthenware vessels called "pan-mugs," and in some

* The Marquess of Cholmondeley and Mr. Tollemache, M.P., with a laudable desire to encourage the suspension of Sunday labour, have, for several years, offered through the South Cheshire Agricultural Society a prize of 20% to such farmer as shall have made the best cheese without infringing on the Sabbath rest. Although this prize has, I believe, been regularly claimed, yet, from a variety of causes, the practice of making cheese on the Sabbath, as on other days, is still very general,

dairies leaden or zinc coolers. Most of the milk-rooms have lattice or wire windows for the circulation of air, and the floors are laid in a sloping form for the free escape of the cold water with which they are daily swilled throughout the summer months. If precautions of this nature be not attended to, there is a risk of the evening's milk becoming *sour*; in which case, whatever quantity of new milk be added to it in the morning, the cheese will be *sour* also. I am led to believe that a temperature of as near 50° Fahrenheit as could be maintained, would be best for a milk-house throughout the year. The *dairy* is generally situate near the milk-house, and fitted up with two *set-pans* or *boilers*—a large one for scalding the whey, and a smaller one for heating water. The “cheese-presses” and “screw” are kept within this room, and the operation of cheese-making is here carried on. Some farm-houses are not provided with a *dairy*, and the cheese is then made in the *kitchen*—this is commonly the case on small farms. The “salting and drying house” (often one and the same room), if conveniently situated, adjoins the dairy. The cheese is placed here on stone or wooden benches, salted *externally*, and is afterwards left so as to dry gradually before being removed to the cheese-room. By some dairy-maids, this external salting is dispensed with, and the room is then of course only used for *drying*. These offices are all on the ground-floor. In some cases the cheese-room is over the dairy, in others over the kitchen, or some other room wherein a fire is usually kept, and sometimes, though rarely, over the *cowhouses* or *stables*. Light and air are invariably excluded, either by a curtain or shutters.* The floor is either of plaster (gypsum) or boards, but more commonly the latter; some of the larger cheese-rooms are warmed by stoves, or hot air, and occasionally, though rarely, by fire-places in the room itself. The small cheese-rooms are seldom supplied with artificial heat, except what is gained from the rooms below. Some cheese-rooms are occasionally found to be in the summer time too warm, in which case the cheese has to be removed for a time to a cooler part of the house. This is more generally necessary where the building is slated, and exposed to the noon-day sun; but is seldom or never experienced where the roof is of thatch. The size of these offices is of course regulated by the extent of the farm; where 30 cows are kept I find them nearly as follows:—

	Yds.	Yds.	Square Yds.
Milk-house	6	by 3	or about 18
Dairy	6	by 5	„ 30
Salting and drying-house .	4	by 5	„ 20
Cheese-room over dairy and drying-house	10	by 5 (or 8 by 6),	„ 50

* One reason, amongst others, assigned for this (universal) practice, is its tendency to prevent the mischievous effects of the fly.

The utensils, excepting those I have described, will be noticed hereafter.

Process of Cheese-making.—As the first process—namely, that of extracting the whey and salting—occupies, according to circumstances, from five to seven hours, it is found most convenient to commence it in the morning. This being the case, the evening's milk has to be kept all night in the milk-house. In the morning, the cream having been skimmed off, a portion of this milk is warmed. This is done in a circular flat-bottomed brass or tin pan (see *a*, fig. 4), floated in the boiler, the water of which has been previously heated for that purpose: the size of this pan is about 20 inches in diameter and 8 inches deep. The quantity to be warmed depends upon the state of the weather; for the first two or three months of the season (say March, April, and May) it is not unusual to heat as much as half the evening's milk to a temperature of 100° Fahrenheit, and this heat is rarely exceeded, excepting by those dairymaids who wish to save themselves trouble in the after process. The "cheese-tub," which is similar to a brewing-tub, having been placed in readiness in the dairy, the cold milk is now put in and the warm added. Supposing the temperature of the cold milk to be about 50°, and the warm 100°, and they were in equal proportions, the heat after mixing would be 75°, or something less; but in warm weather it will be sufficient if it reaches 70°. I have known instances of good cheese being made in summer without warming any portion of the evening's milk, indeed such now is becoming the general practice. In very warm weather some dairy-maids think it necessary to reduce even the temperature of the morning's milk. The *cream*, which is diluted either in about double its quantity of warm or new milk, or by being exposed to the heat of the boiler in the same way as the milk, is next put in. I have before stated that it is customary to retain a small part of the cream for butter: when this is the case, it is considered best to skim it off the whole surface of the cream before diluting, as by that means the froth and bubbles, which are supposed to be prejudicial to the cheese, will, for the most part, be taken off. This leads me to the conclusion that *fixed air*, if it gets mixed in the curd, has been found to be detrimental. Since warming of fluids has a tendency to dispel this fixed air, it is perhaps worthy of consideration whether it would not be better to warm the *whole* of the evening's milk to the required temperature, rather than heating a *part* of it so high as 100°. The process adopted with the evening's milk, as above described, is generally finished previous to the time of milking in the morning; but if not, the dairy-maid stops and completes it before the *new* milk is brought in from the cows. This new or morning's milk is then added by passing it

through a *sieve* placed upon the "cheese-ladder" over the cheese-tub. When the whole is thus collected, some few bubbles are invariably found floating on the surface; these are skimmed off and passed through the sieve to break them.

One of the most important points now to be attended to is the heat of the milk preparatory to coagulation, as the milk, if at a proper temperature, should now be ready to "set together," that is, to receive the rennet. This heat is rarely tested by any other thermometer than that of the dairymaid's hand; some may, and I have no doubt do, determine it pretty correctly, but cannot always.

In consequence of the changes in the weather it is difficult even for an experienced dairymaid to know at all times what proportion of the evening's milk should be warmed; she is therefore cautious not to warm too much, until the morning's milk is added and the consequent heat ascertained. If it be deemed too cool, a little of the evening's milk which has been reserved is then warmed, so as to produce the heat required; but when none has been reserved, the necessary quantity taken from the tub after the admixture of the two milkings is warmed for that purpose. Little is known amongst the farmers or dairymaids as to the *precise heat* which is best. I have seldom heard the subject named, except by a vague comparison that such and such dairies were made *colder* or *warmer* than others. I am acquainted with some farmers whose wives are said to have a peculiar method of their own, and who, I believe, obtain a high price for their cheese in the Manchester market; chiefly from the tendency of the cheese to green mould. I know little of the system which these parties adopt, but I understand they make their cheese "cold"—that is, set the milk together at a low temperature; and I am also inclined to think they use less salt than others. I have not solicited the *privilege* of prying into the *mysteries* pursued in these dairies, nor could I expect to have been so indulged if I had, especially if they had supposed it was for publication. It is said these parties get a greater price for their cheese than many of their neighbours, which I have no reason to doubt; and I think, from what I have seen, they make quite as great a quantity per cow. But the *real* price obtained, and the *precise* quantity made in any particular dairy, is seldom known beyond the farmer's own family and the factor.

I ought, perhaps, to state that I have tasted some of these cheeses, and find them generally very good, fair toasters, and without colouring; but in some I have detected a slight sourness: from this cause, or, what is more probable, from too little salt being used, the cheese will not keep long before decomposition takes place. To the farmer this would only be of consequence in the event of his not being able to sell the article at the time he wished.

In the dairies where I have been permitted to take observations, the lowest heat of setting the milk together was 77°. I am disposed to think those who make a so-called *cold cheese* do not adopt much lower temperatures, even in summer, than 74° or 75°; since a much longer time would be occupied in gathering and compacting the curd, and considerable risk incurred of having what is termed a *sour cheese*.

The evening's milk in the tub being at or about 75°, as before stated, and the milk which is brought from the cows 90° or 95°, the temperature of the whole is then found to be somewhere between 80° and 85°; and I am of opinion that the heat at which milk ought to be and is commonly coagulated ranges between those two temperatures.*

When *colouring* is used, which is not so extensively the case as formerly, it is put into the milk immediately before the rennet. The nature of the article used for this purpose I propose to investigate under a distinct head in the Appendix. The *quantity* of colouring is in some degree regulated by the quality of the milk: if a considerable portion of the cream of the evening's milk has been taken out for making butter, a greater quantity of this colouring matter will be required to give the cheese that appearance which is found necessary to please the *eye* of the consumer, and particularly of those residing in London or at a distance. *Annatto* (or rather a colouring matter which *goes by that name*) is the article used; 1 lb. of it for each ton of cheese is a moderate calculation; this would be after the rate of half an ounce to 75 lbs. The present retail price of the "best *real* Spanish annatto" is 4s. per lb. The colouring is prepared and applied in different ways, but the most common is to take a piece of the requisite size, to fold it in a small bit of linen, and put it in half or a quarter of a pint of warm water the previous night. By this means it gets sufficiently dissolved. When the infusion is poured into the milk, the linen bag containing it is dipped in, and rubbed betwixt the fingers until the colouring is all discharged. The dregs, if any, remain in the bag.

The *rennet*, or *steep* as it is commonly called, is next added. I have already stated in the introduction, that this is an infusion made from the preserved stomach or maw of sucking calves,

* Since writing the above I have met with a farmer in Eddisbury Hundred, who says he used the thermometer during the year 1841 for the first time, and that the heat he uniformly adopted was 84°. I also found a thermometer at another dairy near to this, but it was not in use. I was allowed to test the heat of the milk with it, and found it 78°; this was in *June*. The precise heat at which milk ought to be coagulated is a matter of vital importance in cheese-making, and can only be ascertained by a series of careful and judicious experiments made by scientific and practical parties.

thence called *maw-skins* or *bag-skins*. A recipe for preserving the skins will be found in the Appendix. To define the quantity of rennet sufficient for coagulating a given quantity of milk is a very difficult matter, as the maw-skins vary so much in quality. When the farmer is laying in a stock for the year, he generally calculates upon a dozen of skins to a ton of cheese, but the skins vary in size (the price when cured is from 6s. to 9s. per dozen). In using them, it is the practice often to cut two skins at once. Three square inches taken from the *bottom* (or strongest part) of one, and one or two inches from the top (or weakest part) of the other, is generally found sufficient for sixty gallons of milk. These two pieces of skin are put into a cup containing about half a pint of luke-warm water, with the addition of a tea-spoonful of salt, some part of the day previous to being used. The water thus impregnated with the maw-skin is passed through the sieve into the milk, but the skin itself is generally, though not always, kept out. The rennet cup is well *scalded* before being used again. I have been told that some farmers make a sufficiently large quantity of rennet to last for several weeks, and find it to answer better than making a small quantity daily. The question is, will it keep *sweet*?

The colouring and rennet having been put in, the milk is well stirred and left to coagulate. It is usual to invert the skimming-dish on the surface of the milk—a practice of doubtful propriety, for this reason, that the curd immediately under it does not attain the same adhesiveness as the other, and is one of the causes of what is commonly called *slip curd*. The tub is now covered up, either with a wooden lid, or with cloths supported by the “cheese ladder;” these assist in preserving the heat of the milk, and protect it from dust and dirt.

The coagulation (or “coming”) is generally effected in an hour or an hour and a half. As far as my own observations extend, I am led to think that an average of these two is sufficiently long, if the proper means are used in effecting the formation of the curd: for it is well known that, *cæteris paribus*, the warmer the milk is at the time of setting together, or the stronger the rennet, the sooner will the coagulation take place, but the curd will in consequence be tougher and less in quantity; on the contrary, the cooler the milk, or the weaker the rennet, the longer will the curd be in forming, and the more tender its quality, but its quantity will be greater. By attention to these results the cheesemaker may soon decide when too much or too little rennet has been put in the milk, and correct the quantity the next time. It may be proper here to state that too much rennet has a tendency to impart an unpleasant flavour, or bitterness, to the cheese.

It may generally be expected that the heat of the curd when formed will be four or five degrees less than the milk was when

set together; and it is desirable, particularly in cool weather, that this difference should not be greater, otherwise the subsequent labour will be more difficult. To determine exactly when the *curd* is in a fit state for what is called "breaking," requires some practical knowledge; with attention this is soon acquired. The point is generally determined by gently pressing the surface of the milk with the back of the hand, or by lifting up the skimming-dish, beneath which the curd and whey will distinctly appear if the coagulation is complete. Another criterion is the colour of the whey, which should be of a pale green.

The "breaking" and "gathering" of the curd is the next process. This used formerly to be done by means of the hands and skimming-dish (a practice still continued in some dairies); but the *curd-breaker* is now generally made use of for this purpose (see Fig. 1). It is made of wire-work, in an oval form, and has a tin rim round it about an inch and a half broad. This wire-work cuts the curd, by being passed through it perpendicularly *very, very* gently at first, and in different directions, so that the whole mass is separated into very small portions. The length of time required for the operation depends upon the quantity of curd: for a 60 lb. cheese the operation often takes twenty or twenty-five minutes. After this the curd is left for a quarter of an hour to separate from the whey, and, if the weather be cool, the tub is covered to retain the heat. The curd having separated, which it does by sinking, a portion of the whey at the top is then taken out by the portable brass or tin pan before alluded to, being *pressed* into it, and emptied into the *set-pan*. The curd is then gently broken by the dairy-maid and her assistant passing their hands down to the bottom of the tub, and buoing up a portion of the curd at each time to the surface, or by again using the curd-breaker. The curd having been brought to the top, is easily seized, and separated into smaller portions, and the whey thereby released. This operation takes about half an hour. After the expiration of another half hour (or so soon as the curd is considered sufficiently settled—for there is no saying to five or ten minutes how long each particular interval of rest should be), more whey is taken out, and the curd afterwards drawn as much into one half of the bottom of the tub as its loose texture will admit of.* Upon the curd is then placed a semi-circular board adapted

* At this stage, it is the practice with some dairy-maids, when they suppose the curd is colder or more tender than it ought to be, to return a few gallons of whey after it has been heated over the boiler in the brass pan into the tub again, to assist the discharge of the remaining whey. If, on the contrary, the curd is found warmer than is intended or desirable, which is sometimes the case in hot weather or during thunder, a few gallons of cold water are applied to prevent the curd becoming tough. These incon-

to the size of the tub, with a weight of about 30 lb. placed upon it. This board is perforated with holes, about half an inch in diameter, to allow the whey to escape through. The tub is now set three or four inches ailt to drain the whey more readily from the curd, and to admit of its being collected and carried off. The skimming-dish is again required to lade out the whey. The whey, on its way to the set-pan, is passed through a sieve, to collect any curd which may happen to be floating in it. This curd is what is called *slip curd*, which by some is not returned to the tub, for the reason I have before stated. The weight and board are shortly taken off, and such part of the curd as has been squeezed from under them is again collected on one side, and a heavier weight (say 50 lb. or 60 lb.) applied as before. As the whey escapes from the curd it is laded out. In the course of a quarter of an hour the board is again removed, the curd cut in intersections of six or eight inches apart, to assist the discharge of the whey, and the board, with additional weights (about double the last), again applied. Some dairy-maids now add the slip curd. The weights are again increased if it be thought necessary: observing always to *let the pressure which is applied be gradual, and regulated by the degree of compactness of the curd*, for if this is not attended to now, as well as afterwards, a considerable portion of butyraceous matter will be forced out and the cheese of course deteriorated.

The curd is again cut into square pieces, taken out of the cheese-tub and broken a little by the hands as it is passed into the "thrusting-tub" (a, Figs. 2 and 3). (In some dairies a large-sized cheese-vat, in others a willow basket is substituted for the thrusting-tub.) In this the extraction of the whey is afterwards continued by the application of "the screw," of which there are two or three kinds, but all on the same principle (see Figs. 2 and 3). The old plan of *thrusting*—and from which the *term* is no doubt derived—was by means of a pole four or five yards long, fixed at one end into an upright post, whilst at the other was seated a lusty lad or a man, who kept regularly pressing down the pole upon the curd, the pole acting as a lever. Both poles and men are now almost entirely expelled from the Cheshire dairies; and the *screw* is also likely to be superseded by the "lever press" (Fig. 5). The advantages of this over the screw are, *that it sinks by its own action with the curd—any degree of pressure required can be applied and gradually increased, and less attention is necessary*; whereas the pressure from the screw is sudden and uncertain, and having no self-action, requires the dairy-maid's assistance every five or ten minutes to render it effectual.

The "thrusting-tub," in which the curd has now to be pressed,

veniences would, in my opinion, seldom if ever happen if a thermometer was used at first, and the proper heat at that time adhered to.

is round, and is perforated with holes at the sides and bottom for the whey to escape through (see *a*, Figs. 2 and 3). Before the curd is put in, a "cheese-cloth" of the coarsest kind, about one and a half yard long and a yard wide (or of dimensions sufficient to contain the curd), is placed in it.* In this the curd, after being broken, as before stated, is enveloped, and a "sinker," or strong circular board, which fits the inside of the tub, placed on it (*b*, Figs. 2 and 3). Upon this the screw (or lever press, if used) is let down, and the power gradually applied.

To assist still further the discharge of the whey, long iron skewers are introduced through the perforations in the tub, with their points directed upwards, so that when the skewers are withdrawn there is a drain made for the whey to follow. These skewers do not remain in more than five or ten minutes; the pressure is continued a little longer. The curd is now cut *through*, in intersections of two or three inches apart, with a large *dull* knife, so as not to injure the cheese-cloth, and the edge or corner of the curd is cut off all round, and placed in the centre. After this the pressure is again applied, and gradually increased, and the skewers introduced and withdrawn as before, after the lapse of about fifteen or twenty minutes. The curd is then taken completely out of the tub, cut into four or five pieces, and each piece broken separately with the hands to about the size of two or three inches square. A clean dry cloth is made use of, the curd folded in it, and again pressed and skewered. These operations are repeated until the whey is sufficiently extracted to admit of the curd being *salted*, which is the next part of the process.

If the milk is set together at six o'clock, and the coagulation takes place in an hour and a quarter, the breaking, gathering, and preparation for salting is generally accomplished by eleven or twelve o'clock.

This is merely mentioned as some guide to the *new beginner*, who may not be able to judge from the state of the curd when it is fit for salting. I may here observe that it is the practice in some dairies to salt the curd, whilst, in my opinion, there is *too much whey in it*.

The *quantity of salt* used is regulated by some old custom, or by the fancy or taste of the dairy-maid, and with about as good a chance of correctness as that with which she regulates the temperature of the milk by the touch. That clever and experienced persons may determine the proper quantity of salt in this way tolerably well, I admit; but there are many others who *fall into error*, and all for want of some *fixed rule*. If there be a certain

* *Cheese-cloths* are *linen*, of a rather closer texture than canvas, and made for the purpose. The coarse kind are sometimes termed *screw-cloths*.

proportion of salt which would answer the purpose best, which there doubtless is, why not ascertain and adopt it?

"In all dairies" (says Mr. Wedge, the author of the original 'Report of the Agriculture of Cheshire,' written many years ago, but still equally true) "the same points are admitted to be essential, but although the means of obtaining those are, upon farms similarly circumstanced, so far alike, as to differ materially in the minutiae only, yet upon these minutiae much of the art of cheese-making depends.

"That an exact uniformity does not prevail in every part of the process, is no wonder; for there is not any of the business which is conducted in a dairy which tends to chemical exactness. Where there is no precision, there can be no just comparison; and where no comparison can be made, there exists no foundation for an attempt at uniformity. *The degree of heat at setting the milk together is never measured, the quantity of steep is guessed at, and its quality not exactly known; the quantity of salt necessary is undefined, and the sweating or fermenting of the cheese, when made, is accidental.*"

As an antiseptic, a certain quantity of salt is necessary: it is the same in this respect with cheese as it is with butter or bacon. There may be, and no doubt are, differences of opinion, both amongst makers and consumers of cheese, as to the degree of saltiness which is best; and it may be necessary, in order to suit the palates of the *many*, that there should be a *variety*. I am willing to admit the force of the argument, so far, that there might be these shades of difference in different dairies, but think that they ought not to exist in one and the same dairy. Each maker strives at uniformity as regards the *thickness* and *colour* of his cheese, and would like also to attain uniformity in flavour if he could. Why not, therefore, measure or weigh the salt before using; regulating the same by the quantity of milk or the weight or quantity of curd? The former would easily be ascertained by means of a *gauge*, or graduated rod, which any farmer might make for himself, to suit his own cheese-tub. The way to make it would be to pour into the tub a gallon of water, or any liquid, and then to note its height, and mark it on the rod. This being done, put in another gallon and again mark the height, and so on until the tub is full; taking care afterwards to introduce the rod into the *same part of the tub*, as the bottoms are not often level.

* Since writing the above I have learnt that a farmer in South Cheshire, well known for his introduction of improvements in agriculture, has commenced the system of weighing his curd previous to salting it, and he says he uses salt in the proportion of 1 lb. to 42 lbs. of curd. He also informs me he sets his milk together by a thermometer, and at a temperature of 76° or 77°.—May, 1845.

It has generally been considered that a gallon of milk (supposing little or no cream has been taken from it) will produce upon an average of the season 1 lb. of saleable cheese; that is, when the cheese is four or five months old. In autumn there is always more curd from the same quantity of milk than at any other part of the season.

During wet weather there will sometimes be more milk than usual, though not a proportionately greater quantity of curd. An experienced dairy-maid soon detects these different results, and makes allowances accordingly. I have met with no dairy-maid who regularly weighs the salt; but a highly-respectable farmer, whose wife makes a first-rate cheese, has given me the weight used in his dairy, as near as the same can be *computed*. It is as follows:—

	lb.	lb. oz.	
In March and April their cheeses average about	30	and about 0 10	of salt is used.
In May, June, and July .	70	" 2 0	"
In August	60	" 1 12	"
In September	50	" 1 4	"
In October and November	30	" 0 10	"

In the above instance it will be seen that more in proportion was used in summer than at other times, and that the average is 1 lb. of salt for 40 lbs. of dried cheese (or say forty gallons of milk).

I was favoured with an account from another dairy in which, to oblige me, the salt *for once* was weighed. For a cheese which weighed 46 lbs. a few days after making (say 42 lbs. at four months old) 1 lb. 1 oz. was used. This is also after the rate of 1 lb. of salt for 40 lbs. of dried cheese, and was said to be the quantity uniformly used throughout the year in this dairy, which consisted of about forty cows.

A third account is from a dairy of sixteen cows: the quantity of salt used was generally about 1 lb. for 45 lbs. of cheese; but the dairy-maid made a trial last year with one cheese, using only three quarters of a pound. The cheese was made at the beginning of June, and when weighed in the middle of September was 42 lbs. This cheese was admitted to be better than the others in the same dairy.*

The salt termed the "middle grained" is the kind generally used; but some use "fine." Before applying it the curd is cut into three or four equal sized pieces, and each of these is broken into

* It may not be out of place here to state that at Northwich, which is about the centre of the county, and where the principal salt-works are found, salt is at present bought for 8d. per bushel of 56 lbs. In large quantities the price is considerably lower.

smaller pieces by hand, or is passed *once* through the curd-mill * (Fig. 4). The salt is then scattered over it, and the "breaking" continued either by the hands, the curd-mill, or both, until the salt is well intermixed and the curd perfectly crumbled. Each portion as it is broken is put into the cheese-vat, in which has first been placed a clean and rather finer cloth than was used for the previous process, and the curd is compacted as much with the hands as possible. To admit of the curd being properly pressed, it is necessary to put it into such a vat as it will *overflow* by at least two inches. It is also rounded up a little in the middle. The cloth is then brought over it and tucked in at the edges of the vat with a small wooden knife or other dull-edged instrument. In order to support the outside of that part of the curd which is above the vat, and to keep it in proper form when the press is applied, a tin or zinc hoop or "fillet," the edges of which are rounded off so as not to cut the cloth, and the ends lapping over and unattached, so that the same fillet will do for different sizes of cheese, is introduced round the inside of the top of the vat. The "fillet" thus placed sinks with the curd, and having small perforations in it, the emission of the whey is effected through it as through the perforations of the vat. Since it has become the fashion to make Cheshire cheeses *thicker* than they used to be, it is no unusual thing to see fillets six or eight inches broad.

The vat is now again placed under the screw or lever press, and the skewering is also continued. The pressure is increased at intervals, and the skewers inserted in fresh places to accelerate as much as possible the discharge of the remaining whey or "*thrustings*," as it is now termed.

In the course of an hour from the time of salting the curd is taken from under the screw or lever press and out of the vat, for the purpose of being turned upside down, which is done on a table. In the first place, the angles of that side which was topmost in the vat are cut off; a circular piece, two or three inches deep, is often also scooped out of the centre, and both are broken small with the hands and rounded up in the middle. The cloth being drawn over the curd, the vat is then turned down upon it, and re-turning the vat with the curd in it, the other angles and centre part of the curd are broken in a similar manner: after which the tin fillet is put on, and the screwing and pressing is continued as before for about half an hour or an hour. It will, probably, be two or three o'clock in the afternoon before the curd (or

* The *curd-mill* is of recent introduction, and it is only in a few dairies that it is met with; some dairy-maids highly approving, others objecting to it. I think it will soon be more generally adopted, as it effects a saving in time, and breaks the curd more regularly than it can be done by hand.

cheese, as it may now be termed) *is got under the press*; that is, when it is removed from the screw to the stone press: but where the lever press is used instead of the screw, which, I think, might always be advantageously done, all the change that will now be required is a little more weight at the end of the lever.

Before turning the cheese for the purpose of placing it under the press, it is usual to prick it perpendicularly down with a skewer in several places, for the purpose of making drains for the whey, after having been so turned. A clean cloth is applied, and where the lever press is not used the cheese is put under one of the lightest of the other kind. A pressure of six, eight, or ten cwt., according to the size of the cheese, will be sufficient. This is generally accomplished by about two or three o'clock in the afternoon. Smaller skewers are now used, and remain (by removing them occasionally into fresh places) until about four o'clock: they are then withdrawn, but the cheese remains half an hour longer undisturbed, to allow the whey to drain from it. It is then, or some time in the evening, turned, a clean cloth is put over it, and the pressing continued. If the lever press be used, the weight may be a little increased.

On the *second day* the cheese is generally turned twice or three times; it is also skewered, and clean cloths are used each time of turning. I would observe here, that if any of the cloths are used again before they have been washed and dried in the open air, great care should be taken that they be well *scalded*. The presses used for at least the two first days, and, if possible, during the whole process, should be situate in the dairy, kitchen, or some other moderately *warm place*, otherwise the whey will be longer in discharging, and more liable on that account, from the acidity which it soon acquires, to injure the flavour of the cheese. Another advantage of the lever press is that in cold weather it may be easily moved to a sufficiently warm place, which cannot be the case with the common presses. These common presses are chiefly made of one square block of stone fixed in a wooden frame, but are also made of wooden boxes filled with *slag* or other heavy material. They are generally fixed by the walls of the dairy, for the purpose of being stayed to them, and being there most out of the way; when there is not room in the dairy or kitchen, they are placed in the salting room or pantry, which latter places are often much too cold for the purpose, as the whey seldom gets thoroughly extracted when the presses are in cold situations.

On the *third day*, the cheese is again turned once or twice, but ought not to require any skewering. The heaviest press is now had recourse to, and for a cheese of 60 lbs. or 70 lbs. weight about 30 cwt. will be pressure sufficient; but some dairy-maids apply as much as two tons, their heaviest press being that weight. A cheese-

press of this weight, made of a block of red freestone, would be 3 ft. 2 in. long, 2 ft. 8 in. wide, and 3 ft. 2 in. high.

On the *fourth day*, it is usual in most dairies to discontinue the pressing, but in others it is continued for a day or two longer.

The cheese is then removed to what is called

The Salting and Drying Room.—Sometimes these are distinct apartments, but more generally one room suffices for both purposes. The salt can now, of course, be only applied *externally*: and the good, *if any*, effected is to harden the coat of the cheese. The cheese I have before alluded to, as having been made with three-quarters of a pound of salt, and which *was much above an average in quality*, was removed, as an experiment, *direct from the press to the cheese-room*. I am inclined to think this is the better system, or at least that a great deal of the present labour of the salting-house might be dispensed with.

It is, however, only right to state that in most of the dairies of this county the practice of *external salting* still obtains. I will therefore describe the process usually adopted.

The cheese is taken out of the vat, and a strong bandage called a "fillet," about 2 inches broad, and long enough to go three times round the cheese, is used. As this bandage is put on, salt is applied underneath it, to the coat of the cheese. The bandage is fastened with strong pins, the cheese placed on stone or wooden shelves or benches, and salt spread on the top to within an inch or two of the edges. The cheese is turned daily, and fresh salt and a clean bandage applied. In some few dairies it is the practice, before the salting above described, to half immerse the cheese for two or three days in strong brine kept in a shallow tub for that purpose. The salting process above described is continued for various periods: by some for five or six days, by others as long as three weeks. I will give the rule followed by the farmer who furnished me with the particulars of his salting of the curd (p. 113). It is as follows:—

From the beginning of the season (about March) to the time of the cows being turned out to grass (12th May), the cheese remains in salt four days; from thence to the end of July, ten days; in August, eight days; September, six days; and the rest of the season four days.

It is obvious, from the practice in this dairy, that it is considered necessary for the cheese to remain in salt longer in the middle of summer than at other seasons.

After this salting, the cheese is well wiped or washed, has a clean bandage put round it, and continues in the same room, or an adjoining one, on wooden shelves, for the purpose of being *dried*. It is turned once a day, and remains until it is considered sufficiently dry for being removed to the *cheese-room*. The length

of time for keeping cheese in the "drying-house" varies from seven to twenty days; and is regulated by the temperature of the weather, or the *cheese-room* to which it has to be next removed. In hot weather, and especially if the cheese-room is exposed to the heat of the noon-day sun, the change from a *too cold drying-house* (as many often are, except perhaps in the middle of summer) to a too hot cheese-room, is calculated to cause *cracks* in the cheese, which said cracks have from time to time to be filled up by the application of bacon-fat, or whey-butter, otherwise mites would soon be generated, and the appearance of the cheese detracted from. To prevent this cracking as much as possible, the salting and drying houses have rarely if ever the windows opened, and drafts or currents of air are thereby prevented. This precaution is also adopted in the cheese-room; and, in addition, the light is excluded either by a shutter or *blind*, as I have before stated.

The cheese I have before alluded to as having been made without any *external salting*, as an experiment, and which *was taken direct from the cheese-press to the cheese-room*, was made in the beginning of June, and at the end of September was ready for the *market*. The quality of the cheese was better than that made in the ordinary way, and all the labour of the salting and drying house was saved. My own impression is, as I have already hinted, that the drying-rooms are often *too cold*; and that if it is found to be desirable, as perhaps it may be in some dairies, to continue the use of such drying-rooms, the heat should be kept as near as possible at from 50° to 55° . In concluding my remarks on this room, I must not omit to observe that it is necessary the cheeses should remain *bandaged*, in order to prevent their bulging, and also that they should be turned over once a day. If one cheese be made daily, one will consequently—in the course of a certain time after the season of cheese-making commences—have to be removed every day to the *cheese-room*. When taken to this room, the situation of which I have before described, it is usual to scrape and clean the coat of the cheese, and to place it, in the first instance, in the coolest part of the room, often for a few weeks upon shelves or benches, which are cooler than the floor, subsequently upon the coolest part of the floor, and ultimately upon the warmest part. It is usual to continue the bandage or "fillet" for several weeks after the cheese gets into this room, and indeed in some dairies until it is sold. It is also usual to turn the cheeses, and wipe them with a cloth daily, for at least three or four months, and every alternate day afterwards; and when there are any symptoms of cracking, bacon-fat, hogs'-lard, or some other fatty substance, is applied. The floor of the cheese-room is generally covered with dried rushes, or a coarse

grass resembling rushes, called "sniddle," or wheat-straw. The floor should be *level*, otherwise the cheeses will not be kept easily in shape; and should be well washed with hot water and soft soap about twice a-year. The temperature of the cheese-room should, when attainable, range between 60° and 65°. When this is the case, the "first make" will generally be ready for the factor by September or October, and the "latter make" by December or January; but in consequence of many rooms being badly situated and imperfectly heated, the farmer very often does not get his cheese into the market until two or three months after these respective periods. The object gained in having the cheese-room about the temperature I have named is three-fold: the perfect fermentation and ripening of the cheese, the reduction of labour, and the quicker return of *profit*.

It is usual in this county to sell the cheese by what is sometimes termed the *long hundred* (120 lbs. to the cwt.), but the factors often require 121 lbs. The price varies with the quality of the article, the state of the market, and the size of the cheese, for large cheeses always sell for more per lb. than smaller ones. There is perhaps nothing more difficult to ascertain than the average price of cheese, inasmuch as both farmer and factor make the price a secret. The highest I heard of last season (1843) was 72s. per cwt. of 120 lbs., or a little more than 7d. per lb.; the lowest would probably be about 40s. or 45s.*

Conclusion.—I am aware that a great deal might still be said bearing on this subject. The various defects of cheese, the great difference in the flavour, the effects of different pasturage and food, and various other matters, might be discussed, but it is considered this essay is already too long and tedious. I shall therefore content myself by giving the following tabular statement, and the information promised in the Appendix. I cannot, however, close my remarks without expressing my admiration of the industry, cleanliness, and frugality of the Cheshire dairy-maids. Their labours are great indeed; their cleanliness not to be surpassed; and to their good management it is, that the landlord may often consider himself indebted for the *whole of his rent*.

* There is a general wish on the part of the farmers to adopt the standard weight of 112 lbs., but the factors have hitherto in a great measure succeeded in purchasing according to the old custom of 120 lbs. The law for regulating weights and measures has little or no effect in this county, as the numerous customs at variance with that law, and still in operation, bear testimony.

TABULAR STATEMENT of Observations taken at Four Farms in CHESHIRE;—viz. Nos. 1 and 2 in Bucklow Hundred; No. 3 in Nantwich Hundred; and No. 4 in Eddisbury Hundred.

Note.—At Farm No. 1 there are Two Observations.

	Day of Observation.	No. of Cows.	Quantity of Milk at Two Milkings (except No. 3).	Heat of Milk when Rennet was put in.	Quantity of Rennet.	Time occupied in Congellation.	Heat of Curd and Whey when Curd was made.	Heat of Dairy Room in which the Cheese was made.	Time occupied in gathering the Curd, and commencing the formation of the Cheese.	Quantity of Salt used in curdling.	Weight of Cheese made in a day or after Making.	Weight of Cheese taken from the period of making.	Quantity of Cream taken from the Milk.	Quantity of Whey.	Quantity of Cream.	Quantity of Whey.	Size of Cheese.
No. 1.	Nov. 21.	42	Galls. 43	89°	{ About 3 sq. in. of skin, 1 pint of water. }	h. m. 0 50	79° but raised with hand when to 78°.	..	h. m. 5 0	lb. oz. 1 1	55	47 Aug. 17 following.	Qrs. ..	Gall. 37½	Qrs. 5½	Qrs. 4	{ 1½ Diam. { ¼ Deep. Aug. 17.
	Aug. 17 following.	48 { Two Cheeses made in 2 Tubs, 24 56	89° 86°	{ 3 sq. in. skin, ½ pint of water. } to each Cheese.	1 0 1 0	68° at 7 o'clock.	..	..	..	2 4	{ 58½ { 53 }	..	1½	102	13½	..	..
No. 2.	Oct. 13.	10	24	78°	{ 3 sq. in. skin, ½ pint of water. }	0 45	74°	..	4 0	0 4	..	..	..	22	3	3	{ 16 Diam. { 7¼ Thick. Aug. 30.
No. 3.	Aug. 10.	26	56	..	..	1 0	..	79° at 11 o'clock.	5 15	1 0	60	..	1	47½	..	..	..
No. 4.	Aug. 19.	53	107	77°	{ 12 or 16 sq. in. of skin, 1 pint of water. }	1 45	72° { Morn. 64° Noon 67° }	..	..	4 4 besides one half in Milk.	2 Cheeses made; weight not ascertained.	{ 57 { 53 { 51 { 48 { 47 { 46 { 45 { 44 { 43 { 42 { 41 { 40 { 39 { 38 { 37 { 36 { 35 { 34 { 33 { 32 { 31 { 30 { 29 { 28 { 27 { 26 { 25 { 24 { 23 { 22 { 21 { 20 { 19 { 18 { 17 { 16 { 15 { 14 { 13 { 12 { 11 { 10 { 9 { 8 { 7 { 6 { 5 { 4 { 3 { 2 { 1 { 0	4	98	..	{ 15 Diam. { 8¼ Thick. { 15 Diam. { 8 Thick. { 15 Diam. { 8 Thick. Sept. 16.	

These Observations are not so complete as might be wished, not having been taken at the time in a *tabular form*, and with a view to publication.

Note.—Cheese loses about 15 per cent. in weight the first year.

APPENDIX.

The Scalding of the Whey, and the Making of Whey-Butter.

THIS process is carried on simultaneously with the making of the cheese. The whey which comes from the curd previous to its being salted is called the *green whey*, and that which is extracted afterwards the *thrustings*, or white whey. The latter are more or less impregnated with salt. As soon as the principal part of the green whey is collected in the *set-pan*, a fire is lighted under it of Cannel coal, crop-wood, or other quick burning fuel. The remainder of the green whey is added after the fire is lighted. It is usual to skim off any small particles of curd which float on the whey, and give them to the poultry. Whilst the whey is heating it is necessary that it should be frequently stirred, or it will be liable to burn to the bottom of the pan. When it has attained a heat of about 160° or 170° , if any whey is wanted for the family it is then taken out. When the whey has reached the heat of 180° it is in a fit state for *breaking*. This may be effected by any simple acid, but it is customary here to use sour buttermilk, and with it the *thrustings* of the previous day. The quantity of buttermilk necessary may be easily ascertained. I have only noted what was used in one instance, which was 1 pint of buttermilk and 2 quarts of thrustings (which had been mixed the day previous to being used, and kept in a tolerably warm place to increase the acidity) to 22 gallons of whey. The *breaking* by this method, which is almost instantaneous, has the effect of causing all the creamy matter to rise to the surface, from which it is regularly skimmed off, and put into a cream-mug. The last skimmings are termed *fleetings*, and are generally reserved for the use of the servants. It is necessary, after the *breakings* are put in, to check or withdraw the fire, to prevent the whey from boiling. The refuse whey, after the cream is skimmed off, is laded out of the pan for the use of the pigs; and it is generally conveyed by a spout fixed above the pan, which leads to a cistern or tub in which the pig-meat is kept.

The making of butter from *whey-cream* varies very little from the process of making butter from the cream of milk. The cream is kept for three or four days, or until it has become clotted (provincially termed *calved*). Those who make the best whey-butter have a spigot and faucet to each of their cream-mugs to let off the whey, which in the course of a few hours settles at the bottom, and which, if allowed to remain, imparts a rank flavour to the cream, and consequently to the butter. The temperature of the cream, when put into the churn, is generally ascertained by the hand; but if a thermometer be used, the heat which I would recommend is 60° , having found that the best. If it be much *higher* than this, the butter may be expected not only to be soft, but inferior both in quantity and quality; and if much *lower*, the operation of churning will be prolonged, and indeed tedious. At this heat the time in churning

will probably be about an hour and a half. It will perhaps be necessary in cold weather to put hot water into the churn, and in warm weather to put in cold water, in order to attain this desirable object as to heat.

From 100 gallons of milk there will not be less than 90 of whey, which should yield from 10 to 12 gallons of cream, or $3\frac{1}{2}$ to 4 lbs. of butter. The quantity of whey-butter per cow is about half a pound per week, taking the season through; but with that small portion of cream of the evening's milk (to which I have alluded at p. 106) added, the farmer often churns as much as three-quarters of a pound of butter per cow per week, or from 20 to 25 lbs. per annum: 1 lb. of salt is sufficient for curing 37 lbs. of butter, if for present use.

Cheese-Colouring.

This ingredient is or should be *annatto* (or *annotto*), the produce of the *Bixa orellana* of Linnæus. It is, I believe, chiefly imported from the West India Islands, and used for dyeing. The colouring chiefly used in cheese-making is *prepared* by manufacturers in this country for the purpose. It gives the cheese that amber or cream-like appearance which is unfortunately required in order to *please* or *deceive* the eye of the London consumer. For the Manchester and Liverpool markets, and for *home* consumption, the Cheshire farmer rarely uses it in his cheese-making, as it is well known it does not improve, but if an inferior article is bought, and especially if much be used, it may deteriorate the flavour very much. Those who wish to be enlightened on this subject would do well to read the 'Essay on Cheese-Colouring,' written by Mr. Whitley of Stretton, published by Ridgway, in which it is clearly proved that the greatest bulk of the cheese-colouring used in this country is only an *imitation of annatto*, but sold by that name, and consisting of such ingredients as turmeric powder, potash, and soft soap or train-oil, well mixed to form a mass along with a *little* "real Spanish annatto." I cannot, for two reasons, here resist inserting a verbatim copy of a paper which was printed and published several years ago by a cheese-factor in Cheshire: *first*, because it is an acknowledgment, on his part, that much bad colouring did then exist; and, *secondly*, because it contains 'A Word of Advice to the Dairy-maid,' which shows what were considered some of the defects of the dairy system at that time, and what in his opinion the remedies. Many dairy-maids even *now* would do well to attend to this latter advice.

"LOOK YOU HERE, AND BUY —'S COLOURING.

"To all that may be concerned in making coloured dairies of cheese, — begs to inform the users of annatto for the purpose of colouring, that he has for the last ten years felt sorry to his heart for great numbers of dairy-owners, to see such bad coloured dairies as he in general has done, and the very great loss the owners thereof have annually met with on this account.

“ ——— having therefore been determined, for the farmers’ interest, to use every influence possible with the manufacturers of this article to have the same genuine, which till lately has been to little purpose, as one-half they have in general sent out has proved to be far short of the colour which the market requires, he has at last gained considerable information from sundry manufacturers; and as he has now engaged a person that has been in the habit of making and seeing this *article made for the period of twenty years* and upwards, and as ——— is now in the habit of seeing and hearing what other manufacturers have been and are doing, convinces him that farmers will still find themselves but little better off by following their old mode, he has determined to make the article of annatto in its genuine and original purity, and is now giving the public a favourable opportunity of having some of this very superior colouring, which, from its brilliant colour, will recommend to the farmer a great variety of customers for their choicest dairies.”

“ A WORD OF ADVICE TO THE DAIRY-MAID.

“ Let your rennet or steep be put into your milk of a temperate heat or warmth. After the curd is formed, do not let any part of it be starved, or get any colder than your own hand.

“ All dairy-maids that would have real fine-flavoured cheese would do well to thrust it with their hands, that there are no cold draughts from doors upon their curd, but keep it gradually warm, but not to scald it neither with water, whey, nor burning vats. Have your first press not too heavy, and in as moderate a warm place as you can possibly place it; study a warm salting-room; use neither flags nor slates for your cheese to lie on, but good planks; your drying-room to be moderately warm, and also your cheese-room; cold damp rooms, flags, or slates, will spoil the handiwork of the best dairy-maids; you should never suffer your cheese to be starved, or get into a cold damp state, as it very materially hurts the flavour.

“ Good calf skins, or calves’ bags, as are invariably made use of, are of serious consequence to the flavour and the coming of the cheese.”

A Recipe for Curing the Maw-Skins.

Procure the skins fresh from the butcher the year previous to their being wanted; clean out the chyly matter, and every other apparent impurity; the inside is then turned outward on a table, and salted; the skins are then laid one upon another, with a layer of salt between each, in a deep earthenware vessel similar to a cream-mug; they are then covered over with salt, and have a lid of slate or flag placed on the top. They are taken out as wanted, about a month previous to being used, and the brine drained from them. They are then spread on a table, and fine salt is powdered on each side. In this state they are rolled with a paste roller, distended with a splint of wood, and hung up to dry.

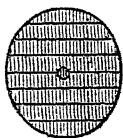


Fig. 1.

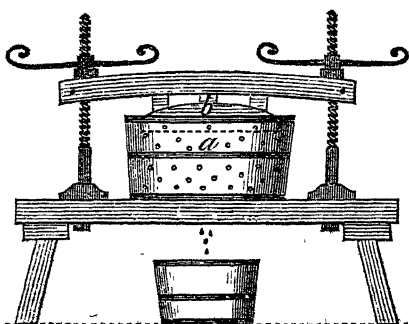


Fig. 2.

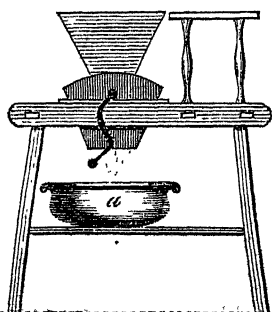


Fig. 4.

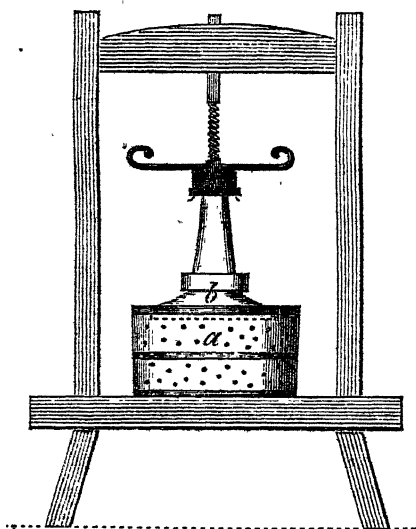


Fig. 3.

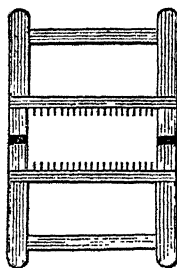
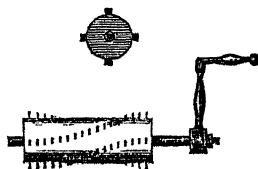


Fig. 4.

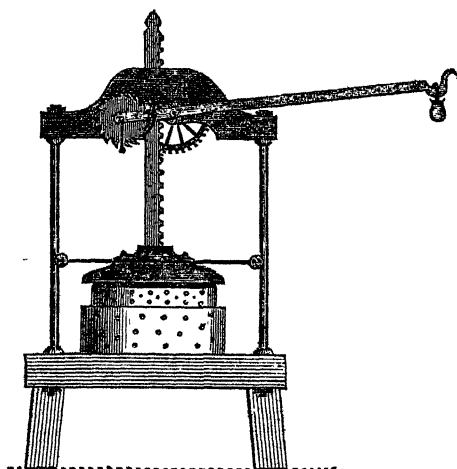


Fig. 5.



Scale, 2 feet to an Inch.

February, 1844.

IX.—*On reducing the Cost of permanent Drainage.* By JOSIAH PARKES, Consulting Engineer to the Society.

To Ph. Pusey, Esq., M.P.

MY DEAR SIR,—You have inquired of me what may be the cost of drainage to parties disposed to manufacture their own pipe-tiles, and to execute the work on the most economic and effective principles as to depth and distance.

The following Table contains particulars of the cost of very perfect draining, performed by tenant-farmers, at various depths and distances, who purchased their pipes at the different tileries in their respective districts, and therefore at different prices. But, in order to place the matter clearly under the eye of any one disposed to erect his own tilerly and drain his own estate, I have reckoned the pipes at one common price; viz., 6s. per thousand and per thousand feet—a price at which, I have no doubt, they may be manufactured, in most cases, and delivered into fields within a compass of 3 to 5 miles from the site of the proprietor's

INSTANCES of the Cost of DRAINING an ACRE of LAND, the Drains being laid with Inch Pipes at various depths and distances asunder; the Pipes being assumed to cost Six Shillings per Thousand if manufactured upon an Estate.

No.	Depth of Drains.	Distance between Drains.	Length of Drains per Acre.		Cost of digging Drains.			Pipes per Acre.	Cost of Pipes per Acre.	Total Cost of Drains per Acre.			Character of Soil.	Authority and Place.
			Rods.	Furlongs.	per Rod. 3d.	per Fur. 10s. 0d.	per Acre. 20s. 0d.			£	s.	d.		
1	3	33	80	2				Feet. 1320		1	7	11	Uniform clay	Thos. Hammond, tenant-farmer, near Fenshurst, Kent.
2	3	33	80	2	3	10 0	20 0	1320	7 11	1	7	11	ditto	Henry Pulland, tenant-farmer, Seytherst, Sussex.
3	3 to 4	33	80	2	4	10 0	26 8	1320	7 11	1	14	7	ditto	Jno. Thompson, tenant-farmer, Woolver's farm, Horley, Surrey.
4	3 ft. 6 in. to 4.	40	65	1.65	4	13 4	22 0	1089	6 6	1	8	6	ditto	Thos. Hammond.
5	4	50	53	1.325	6	20 0	26 6	875	5 3	1	11	9	Clay, with some stones.	ditto.
6	3 to 3 ft. 5 in.	49½	53.3	1.333	8	26 8	35 6	880	5 4	2	0	10	Clay, super; hard gravelly subsoil.	Hen. Simmonds, tenant-farmer, Hadlow, Kent.
7	4	49½	53.3	1.333	8	26 8	35 6	880	5 4	2	0	10	Clay, super; hard gravel bottom.	— Kipping, Hadlow, Kent.
8	4	66	40	1	8	26 8	26 8	660	4 0	1	10	8	Various; clay, gravel, sandy loam.	ditto.
9	3 ft. 6 in. to 4	33	80	2	7½	25 0	50 0	1380	7 11	2	17	11	Clay, super; hard black gravel, and springy subsoil.	Jno. Taylor, tenant-farmer, Mere worth, Kent.
10	2 ft. 6 in. to 3	30	88	2.2	Stone Drains; cost 14½d. per rod for digging, getting, drawing, and breaking the stone, and filling in.					5	8	2	Clay and stiff loam, super; with stones in subsoil.	— Bartlett, tenant-farmer, Butleigh, Somerset.
11	3	20	132	3.3	Ditto					8	2	3	Clay, with some boulders in subsoil.	— Maidment, tenant-farmer, near Butleigh, Somerset.

own tilery. I refer to pipes of an inch bore, a size sufficiently large for all the parallel or general drains in most descriptions of land from which surface-water alone—that is rain-water falling on it—has to be removed. In cases where land is wetted by springs, the bore of the pipes used must necessarily be larger, and adapted to the quantity of water to be conveyed away in each particular case. This will augment the cost of drainage in soils of certain texture, though not in all: as it may happen—and I have met with many such instances—that a single spring, though small in itself, has saturated a whole field; and a single drain, placed at sufficient depth, has laid the whole of that field dry.

There is another condition of things which materially affects the cost of drainage: viz., the size of the fields, and the nature of the boundary fences and outfalls. I am at present about to execute the drainage of two estates, in one of which each field, ranging in size from about 10 to 25 acres, has a deep ditch or a running stream at the foot of every slope, so that not a single carrier or main drain will have to be laid down. Few other than inch-bore pipes will there be requisite. In the other estate there are but few ready-made ditches, so that covered carrier-drains, proportionate in size to the number of the parallel drains emptying into them, and to the distance of the outfall, will have to be constructed. All other circumstances, therefore, being alike, the drainage of the latter estate will be the more costly.

These different circumstances—the ever-varying character of soil as respects its power of transmitting water, which must govern the judicious drainer in his choice of depth and distance—with other conditions, such as the relative hardness of the subsoils to be excavated—necessarily render it impossible to assign one cost as an universal rule in drainage. The instances of cost given in the Table comprehend a variety of soils and subsoils, the texture of which occasioned very different wages to be given for opening out the trenches. The pickaxe had to be resorted to in Nos. 6, 7, 9; whereas Nos. 1, 2, 3, 4, 5, exhibit the usual charge in the district for excavating uniform, or, as you well call them, *honest* clays at the depths cited.

I have preferred to quote instances of drainage as effected by tenant-farmers rather than work executed under my own direction, in the belief that more satisfactory evidence of cost will be thereby afforded to the agriculturist; and because it shows that what one man has done, another may do, and that without having recourse to professional drainers. The drainage performed by the tenant-farmers whose names and addresses are given cannot, as far as I am aware, be improved upon, except that those who have drained at 3 feet deep would now be urged, by their experience, to lay their pipes at 4 feet deep, in preference, wherever practicable.

Several of these farmers have under-drained lands again which were previously shallower drained; and they agree in stating the beneficial result, in every case, to have equalled their expectation, and to have quickly repaid the cost. I would advise any farmer, desirous of using his own eyes and understanding, in judging of the action and effect of these small and deep pipe-drains, to make the round of the farms quoted. He will find a set of as intelligent agriculturists as Britain can produce, a lovely country, clay to his liking, but no water on its surface, and no excess in it. I also engage him to visit, in addition, Mr. Thomas Spencer, of Park Farm, Wrotham, Kent, who will show him fields which he has successively drained 2 feet, 3 feet, and 4 feet deep, and who will explain to him the progressively increasing fertility which he has found to result, *in the same field*, from the removal of water to a progressively greater depth below the surface.

In addition to the facts recorded in the table touching pipe-drainage, I have inserted two cases of the cost of stone-drainage in Somerset; and here again it must be remembered that the cost of stone-draining very much depends on that of the material, and on the distance to which it has to be drawn. I have very lately visited Devonshire, and found that stone-drainage has cost on the estate of Earl Fortescue from 5*l.* to 10*l.* per acre, the drains not reaching 3 feet in depth; and I received all particulars of the drainage of a considerable farm by a tenant of Sir T. D. Acland's, Bart., near Exeter, which cost between 11*l.* and 12*l.* per acre. In this last case the drains varied in depth from 3 feet to 3 feet 6 inches. Horse-shoe tiles were used in the bottom, costing 35*s.* per thousand, and these were covered with stone, the carriage of which alone amounted to 4*l.* per acre. The drains were laid 33 feet asunder. The trenching a very compact gravelly clay cost from 10*d.* to 1*s.* per rod. The drainage of the whole of the arable land of this farm was executed at Mr. Burdon's (the tenant) own charges; and I have thought this instance worthy of record as a proof of the estimation in which draining is held by an admirable farmer, undaunted by its cost, as well as an instance of enormous waste of money.

It will be understood that the column of the table entitled "*total cost of drains per acre*," does not give the actual cost to the draining tenant. This has to be increased by the difference between the price he paid for his pipes and 6*s.* per thousand assumed by me as their cost to a landlord making his own pipes by the best machine, and in a well-arranged tilery. For example, Mr. Hammond paid 21*s.* per thousand for his pipes, so that their actual cost to him, in case No. 1, was 27*s.* 9*d.* per acre, instead of 7*s.* 11*d.*, making the total cost of that drainage, to him, 2*l.* 7*s.* 9*d.* per acre, and No. 5 cost him 2*l.* 4*s.* 11*d.* per acre; whereas the

same work executed by his landlord, with pipes produced by himself, but carrying no profit, would cost, as per table, 1*l.* 7*s.* 11*d.* and 1*l.* 1*s.* 9*d.* respectively. This is a naked expression of the facts, and it may be useful as pointing out the absolute saving to both landlord and tenant, when the landlord may be enabled, from the magnitude of his estate, the presence of suitable clay, &c., to manufacture his pipes, furnish the skill, and undertake a systematic drainage for his tenants on a good and cheap plan. For the reasons before stated, the cost of main drains and the opening out or deepening of ditches is not given in the Table, which must, therefore, be regarded as representing simply the cost of inch-pipe parallel or general drains irrespective of other conduits.

Ever, my dear Sir, very truly yours,

JOSIAH PARKES.

11, Great College Street, Westminster,
May, 1845.

X.—*Letter on Deep Draining.* By the Right Hon. C.
ARBUTHNOT.

To Josiah Parkes, Esq.

DEAR SIR,—You desired to be informed of the particulars of the experiment I communicated to you of laying land dry by drains *four feet deep*.

I was induced to make the experiment from reading an article written by you, and which was published in the Journal of the Royal Agricultural Society of England, vol. v. p. 119.

Two paddocks of old grass land, containing together 7 acres, the soil being a very strong clay, and which had been attempted to be drained, but without effect, by shallow drains, appeared to be well calculated for the experiment. I sent directions to my bailiff first to pare the turf of the two paddocks preparatory to burning it; and, this being done, to sink drains in each furrow *four feet deep*, and to lay pipes at the bottom of each drain. The shallow drains had been drawn diagonally across the land, but the deep drains were laid down each furrow, the distance between the furrows varying from 45 to 25 feet.

At the time that the work was in progress (commenced since January last) there was scarcely even a single drop of rain; but when it was completed (about six weeks ago) there were some very heavy showers, and it was not long before the effect of the 4-foot drains was ascertained. I ought here to mention that the

pipes in the furrows were $1\frac{1}{2}$ inch, and those in the main drains were 3 inches in diameter.

My bailiff wrote to me, I being in London, that after the rain the water rushed rapidly out of the new main drains, but that none came from the old shallow drains into their main drains. The paddocks soon became perfectly dry, which, as I have already said, was far indeed from being the case with the shallow drains.

I am now so convinced of the efficacy of *deep drainage* that, although the whole of the land I occupy has been drained—partly with tiles and partly with stones, and, as was thought, to a tolerable depth—I intend to cross the old drains with deeper ones, in order to do all in my power to free the land from excess of water.

The main drains recently made ceased to run as soon as the land became quite dry, which shows that it was not kept wet by springs.

Yours very sincerely,

CHAS. ARBUTHNOT.

P.S.—Instead of using pipes of $1\frac{1}{2}$ inch diameter, I should have preferred those for the furrows to have been only 1 inch, being now convinced that inch-pipes would have answered every desired purpose; but inch-pipes were not, I believe, to be procured in my neighbourhood.

Although I was from home when the experiment was made, I can answer for the correctness of my bailiff's account, as he is always most accurate in what he states; and as, moreover, he was—till the trial had been made and had succeeded—rather startled at the notion of draining at the depth of 4 feet.

The paddocks were, as I told you, old grass—originally, as it appears, under the plough; and laid down in such barbarous times that the ridges were not only very high, but also very unequal in width; some being 45 feet, and others only 25 feet broad—which I mention to account for the irregular distances asunder at which my bailiff was obliged to place the deep drains.

C. A.

Apsley House, April 21, 1845.

Mr. Arbuthnot has just confirmed to me, from his personal inspection of these 7 acres, the accuracy of the foregoing statement in every particular. He had the opportunity of inspecting the condition of the land, and the action of the drains, both during and after very heavy and continuous rains. He caused a hole to be dug 5 feet deep about the centre of one of the ridges, and the water was found to stand at somewhat more than 4 feet below the surface. It appears that, at this depth, there are occasional interchanges in the subsoil between clay and chalk with flint; whereas

the shallow drains, which were 2 feet 6 inches deep, were laid in solid clay. There can, therefore, be no difficulty in accounting for the lower stratum bleeding the soil both more perfectly and more quickly than the shallower drains. The deep drains were also executed at a very moderate cost when the price of the pipes—viz. 30s. for the $1\frac{1}{2}$ inch, and 40s. for the 3 inch per thousand—is considered, as appears from the following statement:—

	£.	s.	d.
Cutting and filling drains	10	10	0
Cost of pipes	8	5	0
7 acres, at 2 <i>l.</i> 13 <i>s.</i> 7 <i>d.</i> per acre	£18	15	0

JOSIAH PARKES.

May 27, 1845.

XI.—*Observations on the Natural History and Economy of various Insects affecting the Corn-Crops, including a Saw-Fly, the Hessian Fly, the Wheat-Midge, and the Barley-Midge.* By JOHN CURTIS, F.L.S., Corresponding Member of the Imperial and Royal Georgofili Society of Florence, of the Academy of Natural Sciences of Philadelphia, &c.

CEPHUS PYGMÆUS—the Corn Saw-fly.

IN continuation of this subject from the last Number, I shall proceed with the histories of those insects which infest the corn, and amongst them is one that is very abundant in this country, and with which I am well acquainted in its perfect state, having for many years observed the flies in corn-fields, occasionally in great abundance: yet I have never heard of its economy having fallen under the observation of any English naturalist or cultivator; and it is to the diligence and science of our continental neighbours that we owe the knowledge we possess of the habits of this interesting species.

It is, however, by no means a recent discovery, for in 1819 M. Dugaigneau, a skilful agriculturist of the department of the Loire, made known the metamorphoses of this species and the changes it produced in the wheat.* In his memoir he says, that having pulled up a quantity of the roots of rye at harvest time, he found some white larvæ of a *Sirex*. (pl. m., fig. 1) in the stubble. After the severe winter of 1812-13, he wished to see if the larvæ had perished; he therefore collected some stubble and found them

* Annales de la Soc. des Sciences, Belles-Lettres, et Arts d'Orléans, v. 1, p. 121.

alive: they had not at all suffered, for at the end of March a great many were transformed into pupæ, and many had hatched the beginning of April.*

"The insect," says M. Dugaigneau, "after pairing, pierces the stalk of the rye, below the first knot, to deposit an egg in its interior, which hatches so much the earlier, being warmed by the sun's rays concentrated close to the earth, amongst all the straw of the rye: the little larvæ live upon the interior of the straw, which is then very tender, and upon the nutritive juices of the sap, which ought to form the grains in the ear; it soon acquires sufficient power to be able to perforate the knot in the straw; it then passes through and ascends to a greater or lesser height in the interior; I have found a few which had surmounted all the knots; the larva afterwards descends, and arrives at the base of the straw when it has attained its full growth; it then cuts down the straw level with the ground, before and even at the moment the grain is matured: it sometimes happens that it is not entirely sawed through at harvest time."†

It then descends into the stump of the rye, a little below the soil, where it closes its tunnel with a stopper of sawdust and excrement; it then encloses itself with a transparent covering, a great deal larger than itself, in which it rests eight months (fig. 3). M. Dugaigneau has observed this larva also in the wheat-straw, but it is rare there.

M. Herpin, who has likewise investigated the subject, says,‡ "If you traverse a field of wheat or rye, a week or fortnight before harvest, you may observe a greater or less considerable number of stems, the straight and whitened ears of which elevate themselves above the others, and appear to have attained their perfect maturity. They form a striking contrast with the neighbouring plants, which are still very green, and the heavy ears filled with grains are inflexed and bent towards the earth, whilst the others are entirely empty, or contain only a very small number of grains, which are for the most part shrunk and horny.

"On carefully opening or splitting longitudinally the stubble or the stalk bearing the erect and bleached ears, of which I have just spoken, you will remark, first, that it contains a yellowish powdery *detritus*, formed by the *debris* of the plant which has been eaten internally; secondly, that the knots of the straw are perforated in the interior of the pipe of the stalk; thirdly, that one finds a little above one of the knots a larva occupied in eating the medullary partition of the plant.

* Notice sur quelques Insectes nuisibles au froment, &c., p. 34.

† Annales d'Orléans.

‡ Mémoire sur divers Insectes nuisibles à l'Agriculture, par J. Ch. Herpin.

" This larva, of a white colour, has six rudimentary feet (fig. 1 ; fig. 2, the same magnified) ; its length varying from three to fifteen millimetres (viz., from a line to more than half an inch), according to its age ; its head, rounded, hemispherical, brown, and like horn, is armed with strong mandibles. One finds this larva at the commencement of June ; it is placed in the inside of the stalk, lower down and nearer to the earth as it becomes older, and as the maturity of the plant is more advanced. Finally, some days before harvest-time, this larva retreats nearer to the roots of the plant ; it constructs, inside of the straw, a silken transparent case (fig. 3 ; fig. 4, the same magnified), in which it shuts itself up and passes the winter ; after, however, having taken the precaution to cut the straw circularly on the inside, about twenty-eight or fourteen millimetres from the earth, so that the perfect insect may find no difficulty in issuing from its prison. In consequence of this section, the straw, having no more sustenance, breaks off at the foot and falls to the ground when the wind becomes a little strong ; the field then presents the same appearance as if it had been traversed in every direction by sportsmen or by animals.

" A long time after harvest, and even during winter, we may still find the larvæ enclosed in the roots of the stubble ; to be satisfied of this, it is only necessary to pull up a number of the pieces of straw left adhering to the roots. Those which contain a larva are detached with the greatest facility, because the straw is sawed circularly, as already stated. By looking with attention, one also finds at the same period, quite close to the earth, some very short pieces of stubble, cut very horizontally, which contain the insect. Towards the end of May, or when the wheat and rye begin to ear and before the flowering, the larvæ metamorphose and give birth to a fly (fig. 5). These flies distribute themselves over the fields sown with wheat or rye, and deposit an egg upon the stem of the corn immediately below the ear."

This group of insects is interesting to the naturalist, as it forms the transition from the saw-flies to a family named *Siricidæ*.* Like all such insects, it belongs to the ORDER HYMENOPTERA, the FAMILY TENTHREDINIDÆ, and the GENUS *CERHUS* of Latreille ; and the species before us was named *SIREX PYGMÆUS* by Linnæus, from its being much smaller in size than the other individuals with which he associated it.

1. *Cephus pygmæus* is of a shining black colour ; the head is rather large, with prominent eyes, and three minute ocelli on the crown ; the antennæ are inserted in front of the face ; they are tolerably long and slender, but slightly clavate and composed of twenty-one joints ; the basal-joint is ovate, the second minute, six following elongated, the remainder very much shorter, the apex being oval : the

* *Vide* Curtis's Brit. Ent., fol. and pl. 253 and 460.

mouth in the male is bright yellow, including the powerful jaws,* on the clypeus is a spot of the same colour, and the interior margin of the eyes is likewise yellow; the thorax is oval, and not broader than the head; the abdomen is sessile or attached by its entire base, rather long, slender, and slightly compressed; at the base is a yellow membranous spot, there are yellow spots on each side of the first and second segments, and a dot on the back of the latter, the third and fifth segments have broad yellow margins, the sixth has a narrow one, forming spots on the sides and back, and the apex is yellow; the four wings are transparent and iridescent, there are two marginal and four submarginal cells in the superior, the costa and stigma are yellowish brown, and all the nervures are brown and slender; the legs are bright yellow, including the coxæ and trochanters, but they as well as the thighs have black stripes on the outside; the hinder tibiæ have a pair of spurs on the inside below the middle and also at the apex, they are brown on the outside, as well as the tarsi, which are five-jointed; the claws are bifid at their tips, with little pulvilli between them. The *female* is darker, the palpi and sides of the jaws only are yellow; the abdomen is rather stouter and shorter, the yellow spots on the two basal joints are either very minute or absent, and the margin of the sixth is less apparent, and the bands are more of a sulphur colour; the apex is sloped off obliquely, and encloses a black ovipositor, which is but slightly exposed; the wings are rather smoky; the legs are ochreous, the coxæ, trochanters, and thighs black, excepting the apex of the latter above; the hinder tibiæ are brown outside, and the four posterior tarsi are of the same colour: fig. 5, the cross lines showing the natural size.

This saw-fly is very abundant, annually, on flowers in corn-fields in June, also on grass in woods; and I remember finding vast numbers of the females upon white umbellate flowers growing by the roadsides near Dover, the beginning of July, but I could not detect one male.

The larva is not less interesting, in a scientific point of view, than the imago; for, being an apode—viz., destitute of feet—it is unlike those of the saw-flies, which, it will be remembered, have frequently a great number of legs, and resemble caterpillars more than maggots.† The following is M. Herpin's description of the *Larva of Cephus pygmaeus*: it is six lines long, a little thickened anteriorly, nearly cylindrical, of a yellowish milky white, and tolerably fleshy: its head is rounded, corneous, and ferruginous; there is a minute four-jointed antenna on each side, below which is a little round eye: the three thoracic segments have no feet,

* Vide Curtis's Brit. Ent., pl. 301.

† Vide the caterpillars of the turnip saw-fly in the Royal Agr. Journ., vol. ii. pl. B, fig. 2.

but each has two nipples beneath; the last segment is terminated by a little tubular appendage, which is capable of being protruded like a telescope, and assists the insect in its progress within the tube of the straw to which it is confined: fig. 1, fig. 2, magnified.

The *Pupa*, as represented in Guérin's plate, appears to be cylindrical, and composed of nine segments, tapering towards the tail and thickened at the opposite extremity: it is enclosed in a transparent cylindrical cocoon, about five lines long, rounded at one end and stopped irregularly at the other with an operculum of excrement, &c.: fig. 3, fig. 4, magnified.

In the department of the Charente, on the western coast of France, this insect, to which the people have given the name of "aiguillonier,"* has occasioned very great ravages amongst the standing corn, causing a considerable loss to the cultivators. Similar losses have been sustained in Africa by the colonists, whose corn was attacked in the same way; and the mischief being absolutely of the same nature, M. Herpin thinks it was the operation of the same or an allied species. "The damage," he continues, "done by the *Cephus* to the wheat and rye, in the locality † where I have observed this insect, is serious enough, since the ears produced by the attacked stalks are generally sterile, or contain only a very small number of grains, and I estimate the damage at about one-sixtieth of the whole crop; but that which it caused in Africa and the Charente appeared to be much more considerable."

To destroy this troublesome pest, M. Dugaigneau proposes ploughing in March or the beginning of April. He thinks that the turning over and burying the stubble in the ground would destroy the larvæ as well as the perfect insects, which would not be able to penetrate the soil in order to get out at the period of their hatching: on the other hand, M. Herpin says the best means of destruction appears to be to set fire to the stubble which remains upon the field after harvest, as the larvæ are enclosed close to the roots: he also adds, that all well-informed agriculturists know that the burning of the straw to ashes is one of the most active and economical stimulants of vegetation, especially in strong and argillaceous earths, which the fire dries and calcines; they are ameliorated and improved at all times by this simple operation, which is so easy and costs nothing to execute.‡

Providence has also provided a remedy in a parasitic *Ichneumon* (fig. 6), which is actively engaged in our corn-fields in the destruction of the larvæ of the *Cephus*, with which it has been

* M. Herpin suspected it was the larva of the *Cephus*, and his opinion has been confirmed by M. le Comte de Tristan.

† Metz on the Moselle, in France.

‡ Extract from the 'Mémoires de la Soc. Royale et Centrale d'Agriculture,' A.D. 1842.

found enclosed; and the parent-fly must be endowed with a surprising intelligence, for, as M. Dagonet justly observes, the deposition of the egg "is an operation difficult enough, if one reflect that the *Ichneumon* has not only, like the greater number of the Pupivoræ (or pupæ-destroyers), to touch the skin of the larva but lightly, on which its progeny must be supported, but it has at first to satisfy itself of the exact spot in the stubble where the larva of the *Cephus* is to be found, so that at the same time it pierces the stalk it must reach the larva which is to receive its egg."*

This parasitic fly also belongs to the ORDER HYMENOPTERA, the FAMILY ICHNEUMONIDÆ, the GENUS PACHYMERUS; and the species is named CALCITRATOR by Gravenhorst, in his '*Ichneumonologia Europæa*.'

2. *P. calcitrator* is about the same size as the *Cephus*; the male is black, shining, and pubescent; the head is somewhat globose, but concave at the base; the eyes are rather small and ovate, and there are three minute ocelli on the crown; the palpi are tolerably long and slender; † the antennæ are inserted in front of the face, not so long as the body, slightly thickened towards the apex, and composed of twenty-two joints, the basal one oval, second minute, third elongated, the following decreasing in length, each joint producing a bristle on the inside; they are brown, but yellow beneath: the thorax is narrow and elongated, the post-scutel is narrow and elongated: abdomen somewhat spindle-shaped, but clavate, the apex being thickened and compressed; the petiole is long, narrowed, and pitchy, as well as the second joint; the third and fourth are reddish, edged with brown; the remainder are brown, edged with white: the wings are ample, transparent, and iridescent, the stigma and nervures yellowish brown; superior without an areolet, the stigma and marginal cell are elongated, the upper discoidal one has a short internal branch: legs very slender, excepting the hinder, which are long and stout; they are brown, the four anterior are ochreous on the inside; posterior coxæ long, their thighs are thick in both sexes; tibiæ spurred, hinder long, stoutish, and sometimes inclining to reddish-brown, especially at the base; tarsi five-jointed, claws and pulvilli minute. The female is similar, but the antennæ are shorter, and not pubescent; the abdomen is broader, and not compressed; apex of the petiole, as well as the second, third, and fourth segments, reddish, the second generally with a brown patch on the back, the fifth and following segments are black distinctly edged with white: fig. 6, the female; the cross lines exhibiting the natural dimensions.

I have taken the female at Coomb Wood, Surrey, and in Dorsetshire, resting on gate-posts, in June, and both sexes in hedges, in

* Notices Entomologiques, p. 40.

† Curtis's Brit. Ent., fol. 624a, and pl. 624.

Norfolk and Suffolk, and also in the Isle of Wight; the males I have met with at Darent and Dover early in June; and, at the end of July, both sexes have been abundant in the same localities, and also in Battersea Fields, on umbellate flowers. I may here observe, that there are ten or twelve British species of the interesting genus *Cephus*;* and as I find one of them, named *C. tabidus*, in company with *C. pygmaeus*, it is not improbable that their economy may be similar. I find that Latreille suspected the larvæ fed on the interior of plants, which he supposed might prove to be the various species of grasses;† and Messrs. Kirby and Spence say, “that upon *barley* particularly you will meet with the species of Latreille’s genus *Cephus*.”‡

CECIDOMYIA DESTRUCTOR, Say—the American Wheat-midge.

If Kollar be correct, there can no longer be any doubt that the “Hessian fly” has been detected in Europe. It does not, however, appear to be known in France; and it is now half a century since its supposed introduction into this country caused serious apprehensions amongst the people, and alarmed the agriculturists of England.§ As it is intimately connected with a species which we shall next have to discuss, it may not be unadvisable to give a sketch of its history.

The Americans entertain an idea that this fly was first introduced into their country in straw which accompanied the Hessian troops; whence they have given it the appellation of “Hessian fly.” It has been occasionally a dreadful scourge in North America, for the larvæ have committed such ravages on the wheat-crops as to cause even famine in the land. It was not until the autumn of 1833 that this destructive insect, or a species closely allied to it, was observed in Hungary; whether, from its previous rarity, it had been overlooked, or had not found its way into the Austrian dominions, is not known. Kollar|| states that it appears, from a report transmitted to the Archduke Charles, that in the beginning of June the ears of wheat were observed to droop and the straw to bend, on his estates at Altenburgh, although the crop was previously in fine condition: in a few days, patches on the poorest soil in different parts became entangled, as if matted together by heavy rains or high winds, which were supposed at first

* Curtis’s Brit. Ent., fol. 301; Guide, Genus 476.

† Hist. Nat., vol. xiii. p. 138.

‡ Introduction to Entomology, vol. iv. p. 503.

§ Mr. Markwick ascertained that the insect which caused such a sensation during the period of scarcity was a *Chlorops*, described in the Royal Agr. Journ., vol. v. p. 484.

|| Naturgeschichte der Schädlichen Insecten, p. 130; and Kollar’s Treatise on Insects, p. 119.

actually to have been the cause. This soon proved to be unfounded; for the mischief gradually spread from the poor to the best lands, until the whole was blighted. Two-thirds of the straw at least was laid in less than a week, and the work of devastation was completed by the heavy fall of rain which took place during the latter part of June. The straw thus prostrated produced only small abortive ears; the few grains they contained were shrivelled, and would scarcely ripen, and the straw was of a very bad quality.

On examining the roots of those plants which had died off, the soft straw where the larvæ had stationed themselves in families, within the sheath of the leaf, appeared withered, tough, and brown, yet not wounded: at this period the larvæ were transformed into pupæ, which were found in clusters inside of each leaf-sheath, at the first joint next to the crown of the root.

On the estates of the Duke of Saxe Coburg, at Weikendorf and in other parts of that neighbourhood, whole fields were destroyed. The larvæ were found to live in society, forming a sort of nest between the straw and the sheath. They are said to penetrate into the tube of the straw: however that may be, they deprive the stem of the sap, and it consequently withers and dies. The larvæ are of a pale green colour, with a minute black dot above: they do not exceed two lines in length; and they live from about three weeks to a month: the pupa is brown, and enclosed in a case. It was several weeks before the fly hatched; it is extremely small and delicate, scarcely so large as a common gnat; the body is clothed with short black hairs: the thorax is very convex, smooth, and shining: the scutellum projects, and is rounded behind; the breast being sometimes of a golden yellow colour, the abdomen brownish: the wings are blackish; the deep yellow of the base sometimes extends to the nervures, where it is gradually softened off: the poisers are yellowish-white; the base of the thighs is golden yellow: the *female* has a black streak on the abdomen.

The above descriptions do not agree with Say's;* and I see, by a paragraph in the Entomological Transactions, Mr. Herrick, of New Haven, North America, had informed Mr. Spence that the accounts hitherto published concerning the natural history of the Hessian fly were very erroneous: he considered it to be referable to Meigen's genus *Lasioptera*;† and it is attacked by five parasites, two of which belonged to the genera *Eurytoma* and *Platygaster*. Mr. Spence also observed, at a previous meeting of the Entomological Society, that Dr. Hammerschmidt's *Cecidomyia*, which is the Hungarian one, is specifically distinct from Mr. Kirby's *C. tritici*;

* Journal of the Academy of Natural Sciences of Philadelphia for 1817, vol. i. p. 45, pl. 3, fig. 1—3.

† Curtis's Guide, genus 1147.

and that Say's *C. destructor*, called the Hessian fly, is different from either.* The female of the American species lays in the autumn not more than eight eggs, which are introduced by her ovipositor between the sheath and the stem, close to the base, where the larvæ feed as soon as they hatch, and are said to live through the winter with their heads downward; but the mischief they cause is not discoverable until the wheat is more advanced.

A parasite, called by Mr. Say *Ceraphron destructor*, but which may possibly be a *Pteromelas* in the opinion of Mr. Westwood, though smaller than the *Cecidomyia*, proves so formidable an enemy, by depositing its eggs in the larvæ, that few of them become pupæ; otherwise, Mr. Say believes that their wheat-crops would be totally annihilated. Kollar also found the majority of his pupæ so full of a similar parasite that he felt convinced the crops would not be attacked by the wheat-midge the following year; which prediction was completely verified. I have been led to give a more extended sketch than I intended of the North American and European "Hessian flies," from my conviction that two species at least have been confounded by Kollar and other writers, owing to their similar economy; and it will be as well to designate our species as

The British Wheat-midge—*CECIDOMYIA TRITICI*, Kirby.

The alarm we have already alluded to in the last century produced good effects, by inducing many talented men to investigate the subject in order to allay the public anxiety; and thus, amongst other noxious insects, we obtained the natural history of the wheat-midge, as it is now called, and little of importance has been added of late regarding its transformations. It will now be my object to lay before the Society the leading points of these contributions, so connected as to enable the agriculturist to understand the economy of this destructive little animal, and to supply materials for perfecting its history as opportunities may offer; for I am satisfied that at a future day these are subjects which will not be found uninteresting or unprofitable to the agriculturist.

In May, 1796, a paper was read before the Linnæan Society by Mr. Marsham, the secretary,† in which he stated that Mr. Long, who farmed land in Hertfordshire, had detected an insect amongst the wheat, towards the end of July, which threatened to do much mischief, attacking from one to several grains in an ear. It was easily discovered from such grains appearing yellow or ripe, whilst the unaffected grains in the same ears were perfectly green. "On opening those grains that seemed diseased," Mr. Marsham "found

* Trans. Ent. Soc., vol. i. p. iv and v.

† Trans. Linn. Soc., vol. iii. p. 242.

in many of them an orange-coloured powder, and in several one or two very minute larvæ, differing in colour from a yellowish white to a deep yellow. They were thick at one end, and gradually diminished to a point at the other, where the head was situate. They extended and contracted themselves at pleasure; to which was added a leaping motion, frequently jumping full half an inch from the paper on which I examined them. The grain where these insects had possession appeared a little shrunk." In the first week of August, Mr. Markwick, of Catsfield, near Battle, found some of the insects in a few ears in his fields; they were lodged between the husks or outward scales of the calyx, which were discoloured, but the grain did not appear to have received any injury. He never met with it in the state of a small white larva, but it was always of a bright yellow colour, and changed into an egg-shaped chrysalis of the same colour. Subsequently he found the larvæ between the corolla and the grain, and even on the grain itself, but he could never discover that they had eaten into any of them. In the October following he was persuaded that his wheat had received no damage from the presence of these minute insects; and he adds, that "since the harvest has been got in I have found the same insect in the husks of the wild bearded oats, *Avena fatua*, but have not yet seen it in its fly or perfect state." In the summer of 1795 Mr. Kirby found citron-coloured larvæ between the corolla and the grain, in the neighbourhood of Ipswich, in Suffolk.

Mr. Markwick again in 1797* first noticed some of the little flies on the 12th of July; they were sitting between the husks of the ears of wheat, the next day they were more abundant, and then he also found a few of the small yellow larvæ of the *Cecidomyia* lying close to the stamina (fig. 10); he observed them in much greater abundance later, but he thought the fly was reduced in numbers at that time. Mr. Markwick bred the *C. tritici* (?) and *Platygaster tipulæ* from ears enclosed in a flower-pot, but he says the *Cecidomyia*, for such it is by a figure given from one of his specimens,† "was as minute, if not less (than the parasite), with a yellow body, spotted and transparent wings, and long-jointed antennæ, beset with small hairs or bristles at each joint." Mr. Marsham terms the spots on the wings "obsolete clouds." I am particular in noticing this, because the wings of Mr. Kirby's *C. tritici* are not spotted, nor are any individuals that I have seen, and excepting the *C. pictipennis*, which is larger, I know of no species of the genus with spotted wings.

In the same volume of the 'Linnæan Transactions' was published Mr. Kirby's admirable paper illustrative of the history of

* Trans. Linn. Soc., vol. iv. p. 225.

† Ibid., pl. 19, f. 2, a, b.

Tipula tritici and its parasite. In 1797 Mr. Kirby says, in a letter to Mr. Marsham, he could scarcely pass through a wheat-field in which some florets of every ear he examined were not inhabited by the larvæ of the *Tipula*, but very few pupæ, not one in fifty. About the beginning of September he bred one of the flies, and describes it as well as the parasitic *Ichneumon*. He searched in vain for more flies in the corn-fields and barns soon after, but could find none, from which he concluded they did not hatch in general in a natural way until the spring, so as the female might be "in readiness to deposit its eggs in the wheat, when it has made so much progress in growth that the larva may be hatched about the time of its going into blossom; and I am confirmed in this opinion by another circumstance. A few days since (the fourth week in September) with a fine needle I carefully took off the thin membrane from two of the pupæ which I had reserved, that I might see how near they were to a change of state; but instead of discovering the lineaments of the future fly, the insect was still in the form of the larva: so that probably the pupa is not usually complete until the spring, and the insect incloses itself in a thin membrane to protect itself from the cold of the winter." Mr. Kirby adds, "It may be objected that this was probably the larva of the *Ichneumon*, which had devoured that of the *Tipula*. To this I reply, that it was in colour, form, and in every respect so exactly similar to the latter that it could be no other."

"I have seen," continues the same learned naturalist, "more than once, seven or eight florets in an ear inhabited by the larvæ, and sometimes so many as thirty in a single floret, seldom less than eight or nine, and yet I have scarcely ever found more than one pupa in an ear, and had to examine several to meet with that. What then becomes of the remainder of the larvæ? Are they destroyed by that of the *Ichneumon*? or do they become the prey of some other insect, or do they fall to the ground when they assume the pupa, and remain there until the following spring? To give a positive answer to any one of these queries I shall not pretend; I will only relate circumstances, and point out from them what appears to me to be most probable. The pupæ that I have observed have generally been somewhat attached to the grain, and, what is worthy of notice, I never found them within those florets where the larvæ had taken up their residence; they seem invariably to choose for their habitation, in their intermediate state, one where the grain is uninjured, to which they may attach themselves (fig. 16). A question here arises, how they contrive to get from one floret to another, having no feet? But as I have never seen them do this, I will not attempt to conjecture how they do it. In the field above mentioned, I took up many roots of stubble, with a large lump of earth round them, to see if I could discover

any of the pupæ concealed in it; but if they were there, they escaped my eye, from their minuteness: yet it seems not probable, nor analogous to the general proceedings of nature, that it should be indifferent to them whether they go under ground or remain in the ear when they assume the pupa. That they are destroyed by any other insect than the *Ichneumon* I have no reason to believe, having never seen them attacked by any other; therefore it seems to me most probable that this little friend to man is the destroyer of by far the greatest part of them."

These unsettled points have recently attracted the notice of Professor Henslow, but he has failed as well as myself in obtaining satisfactory evidence towards settling these obscure traits in the economy of the Wheat-midge; we must therefore rely upon the exertions of the intelligent farmer to supply the deficiencies.

Mr. Kirby is of opinion as well as Mr. Markwick that the larvæ "feed upon the pollen or dust of the antheræ, for in those florets in which it resides the germen never swells, and the antheræ are persisting (fig. 10, *d*, *e*); from which it seems evident that the impregnation of the germen is prevented, either by the insects using some means, perhaps a kind of gluten, to prevent the pollen from bursting from the antheræ, or *vice versâ*, by doing something to the stigma to prevent the fertilization of the germen. The pollen of three antheræ is a store which will maintain sometimes thirty of these creatures from the time that the wheat is in blossom until it is nearly if not altogether ripe. I could never discover that the grain was injured in any other way by this insect, but it invariably produces the inanition of it in the floret which it inhabits. It may always be detected by the discoloured appearance of the base of the corolla, which is its usual station."

In February, 1799, a letter from Mr. Kirby was read at a meeting of the Linnæan Society,* which is so full of interest that I shall be excused for drawing largely upon it in the present instance. "It chanced that on the 3rd of June last (1798) I had occasion to pass through a field planted with wheat, in the evening, and to my great surprise and satisfaction my attention was immediately arrested by an innumerable host of our *Tipulæ* flying about in all directions (fig. 7); and from that day to the latter end of the same month these insects were always to be met with in the wheat-fields. They were seldom to be seen much before seven o'clock; at eight the field appeared to swarm with them, at which hour they were all busily engaged in laying their eggs; and about nine they generally disappeared; they were indeed so extremely numerous, that if each of them were to lay its eggs in a different floret, and those eggs were permitted to produce larvæ, I think,

* Trans. Linn. Soc., vol. v. p. 97.

upon a moderate calculation, more than half of the grain would be destroyed. I have noticed twelve at one time depositing their eggs in the same ear. It is remarkable that amongst the myriads that I have seen of the female, I should not have observed one which I could take for the male; indeed, towards the latter end of the month I took two or three specimens, which, except that they had black bodies and were smaller, appeared exactly similar to our *Tipula*; but as neither their antennæ are hairy, nor their wings spotted, as was the case with the specimen you received from Mr. Markwick, they can scarcely be the male. Indeed the appearance of the male, instead of being later than that of the female, ought to be as early or earlier, in order that they may be in readiness to perform the work of impregnation previous to the season in which the females lay their eggs, which begins, at least it did this year, with the month of June. Hence I suppose that each sex is disclosed from the pupa in the genial month of May.

“Although these insects are so numerous in the evening, yet in the morning not a single one is to be seen upon the wing: they do not, however, then quit the field which is the scene of their employment; for, upon shaking the stalks of the wheat, or otherwise disturbing them, they will fly about near the ground in great numbers. I found their station of repose to be upon the lower part of the culm, with their heads upwards.

“It is very entertaining to observe the method to which these insects have recourse in order to deposit their eggs in a situation where the larvæ may soon arrive at their food: when engaged in this employment they are not soon disturbed; which circumstance affords the observer an excellent opportunity of examination. As I hinted before, a number may be seen at the same time upon one ear: they place themselves in such a position that their anus stands nearly at right angles with the margin of the glume of that floret which they mean to pierce. But how are they to introduce their eggs within the floret, for they deposit them between the exterior and interior valvules of the corolla? To look at them when they are not engaged in this employment, their anus appears to be furnished with no instrument adapted to so nice an operation; but upon pressure it exerts a long retractile tube or *vagina*, which unsheaths an *aculeus* (if I may so term it) as fine as a hair and very long (fig. 8 r). This aculeus it introduces into the floret, and there deposits its eggs, which it usually places upon the interior valvule of the corolla, just above the stigmata. After she has done laying her eggs, the insect withdraws her aculeus with great caution and deliberation: yet it sometimes happens that she is unable to effect this; in which case she is detained a prisoner until some enemy devour her. In this situation I have found

them more than once in my morning walks. I was very desirous of seeing the eggs pass through the vagina, but my first attempts were unsuccessful: at length I was gratified with this pleasing spectacle. I gathered an ear upon which some of the *Tipulæ* were busy, and held it so as to let a sunbeam fall upon one of them, examining its operations under the three glasses of a pocket microscope: I could then very distinctly perceive the eggs passing one after another, like minute air-bubbles, through the vagina, the aculeus being wholly inserted into the floret. I examined this process for full ten minutes before the patient little animal disengaged itself, and at last it was through my violence that she discontinued her employment, and flew away.

“On the 7th of June, upon opening a floret I discovered a small patch of eggs; they were oblong, transparent, and of a pale buff colour. I afterwards found several of these little patches, containing from a single egg only to more than twenty. On the 17th I found for the first time a larva newly hatched: it adhered to the lower end of one of the anthers (fig. 14), and was perfectly transparent and colourless; from which circumstance I conjecture that it had taken no food. I afterwards detected two more in a similar situation, one of which had become straw-coloured from the contrary cause. In another floret, upon the same day, I found many with their heads immersed in the woolly summit of the germen: some were in the interior valvule of the corolla; others appeared to be busy upon the plumose stigmata, upon which I did not observe that any pollen had been discharged from the anthers. On the 22nd I observed that the larvæ were usually in the situation represented in the accurate drawing engraved in the third volume of the Linnæan Society's Transactions (fig. 10). All circumstances considered, it seems to me most probable that these animals do not feed upon the pollen before it is discharged from the anthers (except perhaps when they are newly hatched); yet one would think that in this case sufficient must escape them to fertilize the germen. How they prevent this I can but conjecture; as their heads are often immersed in the stigmata and in the down observable upon the top of the germen, it is possible they may occasion an obstruction in those fine ducts through which the fertilizing principle passes down into the grain; or they may consume that spermatic moisture upon the stigma, without the aid of which the pollen cannot perform its office. On the 29th the parent *Tipulæ* had all disappeared, and soon after this period my investigations were stopped by illness; but as I had brought them down so far as to connect them with those made last year, this interruption was of less consequence.”

M. Herpin is of opinion that it is an inhabitant of France. He says, “I have also found in ears of corn at the time of flowering

many little yellow larvæ, very lively, from 2 to 3 millimètres long, lodged between the chaff of the grain; these larvæ nibble and destroy the generative organs of the plant, and the germen where they are found are steril. These larvæ appear to me to have a very great analogy with those which have been described in the 'Linnæan Transactions' under the name of *Tipula tritici*: it is probably a *Cecidomyia*." He also found in the bottles where some diseased ears of barley and wheat were preserved many *Cecidomydes* in the state of perfect insects.*

The first time I had an opportunity of observing the economy of the Wheat-midge was in July and August, 1840. On the 10th of the latter month Mr. E. Bennet, of Rougham Old Hall, showed me some ears of a red wheat, called "Old Kent," which had a reddish-brown appearance, and when the culms were opened a red powder was discoverable (fig. 11, *h*): upon the backs of some of the grains, which were more or less shrivelled, I observed a long narrow filmy sac (fig. 11, *g*), on opening which a bright orange granulated maggot came out alive (fig. 12); it was attenuated before, with two minute black dots like eyes, and when shut up in a tin box many voluntarily left their cases and wandered about, but although I placed them in a pot with sand and earth I did not succeed in rearing them. The orange dust which I took for the excrement of the larvæ at first, from constantly finding it with them, was composed of oval granules (fig. 15), and when highly magnified appeared to be dotted (fig. *k*). I suppose it was the red-rust, *Uredo rubigo*.†

I have already alluded to Professor Henslow's papers, which have been so recently published in this Journal,‡ that it will be only necessary to review his valuable observations as briefly as possible in connection with some materials and notes transmitted to me upon the subject. In January, 1841, he sent me a packet of fine sifted dust from wheat, containing larvæ and pupæ apparently in various stages of growth; the small ones, which were of a very bright red colour, he thought it possible would prove to be another species, and from the quantity of minute seeds mixed with the barn-dust I think it probable they might be attached to some of the grasses. The larvæ, he observed, were first of a lemon colour, and some became of an orange tint after the wheat was housed in the barn, which might arise from their dying and becoming dried. When perfected they were enclosed in a thin transparent web, by which they seemed to adhere to sound grains and to the inside of the chaff-scales (figs. 16 and 17). Whilst most of the larvæ remained secreted during the winter amongst

* Herpin's Memoir, p. 29.

† Journal of Royal Agr. Soc., vol. ii. p. 9.

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‡ Ibid. p. 24.

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the chaff, many of them quitted the ears and fell to the ground, when they buried themselves; these Professor Henslow had good reasons to believe were punctured by the parasitic *Ichneumons*,* but we both failed in proving the fact, as the whole of the larvæ died. Some of them, I believe, were alive in January; and I entertain the same opinion as Mr. Kirby, that they lie as larvæ in the transparent cases until the spring, when they become chrysalides, for this power of remaining in a quiescent larva state is common to many Orders of Insects,† and no doubt is a provision to retard their premature appearance, and thus secure species from casualties which might lead to their extinction. This, however, being an important point in their economy is deserving our attention. In a natural state the corn would generally be beaten down in the winter; if not, the grains would fall out, get buried, and vegetate; or they might lie in the calyx or chaff protected. May not the attached larvæ, enclosed in their cases, thus pass the winter, and in the spring change to pupæ in the earth?‡ Of course a vast quantity would be destroyed by birds and vermin feeding on the grain, but the housing and threshing of the corn being an artificial system, we must look to the process the insects would be liable to in a state of nature. If some infested corn were left to stand at harvest and examined weekly, it would in all probability throw considerable light upon this puzzling but important stage of their economy. The wheat might be transplanted, and protected from birds by netting, for the object would be to have the ears exposed to the variations of the atmosphere, and the earth naturally moist to receive the larvæ, if they were disposed to leave their filmy cells. It may also be asked, if the mass of the larvæ are transformed to flies during or soon after harvest, where do the parent midges come from that deposit their eggs in the growing corn whilst in flower the following summer? If indeed this insect will live also in the glumes of *early* grasses, which is quite possible, that would solve the difficulty; but I am of opinion that the specimens bred by Mr. Markwick and Mr. Kirby late in the summer may be considered as exceptions to the usual economy of the insect, for at that period of the year there is no corn in a fit state to receive the eggs of the females.

The Wheat-midge is not confined to any particular districts that I am aware of: it has certainly been observed in Norfolk,

* Journal of Royal Agr. Soc., vol. ii. p. 26.

† As the saw-flies or Tenthredinidæ, amongst the Hymenoptera, and the Sphingidæ and Bombycidæ, amongst the Lepidoptera, some of which remain two years or more in their cocoons. *Vide* Curt. Brit. Ent., 2nd edit. folio 3, p. 4.

‡ It is true that Mr. Kirby bred a wheat-midge from the ears of wheat, but that was late in the summer, and I am not aware that any one has bred the spring broods, which must first deposit their eggs in the growing corn.

Suffolk, Hertfordshire, Sussex, Dorsetshire, Devonshire, Cornwall, Shropshire, the north of Ireland and Scotland. On the 17th June, 1842, I found the flies abundant near Glanville's Wootton, Dorset: in walking through a wheat-field, which was just coming into ear with here and there a spike in flower, I saw the little ochreous *Cecidomyia* flying about, alighting on the ears, and getting a little between the chaff. They were all females, as far as I could observe; with them I also detected a few of the parasitic *Platygasters*. Having now detailed all that is known relative to the economy of the British Wheat-midge, I will describe the fly. It belongs to the ORDER DIPTERA, the FAMILY TIPULIDÆ, and was formerly included by Linnæus, Kirby, &c. in the GENUS TIPULA; but owing to its structure, and the neururation of the wings* departing considerably from the typical species, it has very properly been separated from that immense group, and is now designated by Meigen and others

3. *Cecidomyia tritici*: the female (figs. 7; and 8, the same magnified) is pale ochreous, pubescent: eyes intensely black, and coarsely granulated, meeting on the crown and covering nearly the whole head; ocelli none; no part of the mouth is visible, except a short bilobed pilose lip and two incurved palpi or feelers, they are four-jointed and slightly pilose: the antennæ are stretched forward or curved upward, and inserted close together in front of the face; they are as long as the body, pale brown, and clothed with longish hairs; they are composed of thirteen sub-elliptical joints, contracted round the middle and connected at the ends by a single thread, like a string of beads (fig. s): thorax ovate and deep reddish ochre; scutellum transverse-oval: abdomen rather short and tapering to the apex, which is furnished with an ovipositor nearly thrice as long as the body, the sheaths at the base stout, the oviduct exceedingly slender (fig. 8, r): wings incumbent in repose, longer than the body, yellowish white, and beautifully iridescent, pubescent, and ciliated, costal nervure surrounding the wing, subcostal short, second extending to the margin, third shorter, the apex forked: two halteres or poisers large and capitate: six legs, long, slender, and nearly of equal length; thighs and shanks equally long; tarsi or feet five-jointed, basal joint minute in all, second as long as the tibiæ, the remainder decreasing in length; claws very minute (fig. u, the articulated foot). The male I have never seen, but no doubt the antennæ are different, being usually composed of twenty-five globose joints which are more remotely strung than in the female,† as exhibited in fig. t.

Mr. Kirby describes the pupa or chrysalis as slender, acute at both ends, and of a reddish colour.

* *Vide* Curtis's Brit. Ent., pl. and fol. 178, for dissections.

† *Ibid.*, pl. 178, fig. 3.

In addition to what has been already said of the larvæ, it may be added that the greater number I have seen were of a lemon or pale orange colour; they tapered to the head, which was pointed when they were in motion, and the tail was rounded, the sides being plaited or wrinkled, and forming little tubercles which assist it in locomotion (fig. 12; *z*, the same magnified): the skin or membrane in which they were so often enclosed, although white and perfectly transparent, was of so close a texture that it was like a bubble of gum, and all that I examined were impressed with the transverse sutures corresponding exactly with the abdominal segments of the larvæ (fig. 18, *p*), and it is worthy of remark that all these cases were fractured at the head, as if an attempt had been made to escape, which was supported by the fact that their tails did not reach the apex of the case (fig. 18).* On taking out these larvæ in January I found them dead, depressed, hardened, and granulated (fig. 19); they were composed of ten distinct and two less defined annulations, the penultimate one was notched beneath (fig. *q*), and the intestinal canal shone through on the underside. I have added a magnified figure from a drawing made for Sir Joseph Banks, and published in the 'Linnæan Transactions' (fig. 13),† as it shows the papillæ or nipples which assist the larva in walking, but it does not give the character of those which I have seen.‡

The Genus *Cecidomyia* is an extensive group containing nearly thirty British species,§ and one of the most remarkable features in their history is the great differences which exist in their economy: a large portion of them form downy excrescences, like galls, upon various plants, as the field wormwood, ground-ivy, a species of speedwell, and the common campion; others inhabit the leaves of the Scotch fir, the buds of a willow, and the flower-buds of the common hedge-mustard; and there are a few which Bouché says infest decayed tulip and hyacinth roots and half-decayed cowdung.

Mr. Kirby describes three minute parasitic insects which seem to have been ordained by the Author of the Universe to limit the depredations of the Wheat-midge, and they so effectually execute their mission, that it has often happened, a year or two after the Midges were in excess, not a specimen could be found. As these insects are most interesting objects, as well for their valuable ser-

* I find that Mr. Gorrie has stated in the Magazine of Nat. Hist. for 1829, that all the larvæ had deserted the wheat-ears and descended into the earth by the 1st of August, about half an inch only below the surface.

† Vol. iii. pl. 22, fig. 12.

‡ Professor Henslow is inclined to think, from differences in the larvæ he has examined from various localities, that there is more than one species of wheat-midge. *Vide* his Report, vol. iii. p. 39.

§ Curtis's Guide, genus 1149.

vices as for their curious habits of life, I shall enter with pleasure upon their histories the first opportunity.

Notwithstanding these valuable agents, we find the amount of damage very considerable, as will be shown by the result of Mr. Kirby's examination in the neighbourhood of Barham, in Suffolk. "To ascertain the quantity of mischief produced by one *Tipula* within particular limits, I went to a field of fifteen acres, which was planted partly with white and partly with red wheat. In this field I took five stations, one on each side and one in the centre. In each station I examined a certain number of ears, grain by grain, without selection. The result was that in thirty ears of white wheat, seventy-three grains were destroyed by the larvæ, which is at the rate of not quite two and a half grains to an ear; and in twenty ears of red wheat twenty-nine grains were destroyed, which is nearly at the rate of one and a half grains to an ear. Take the whole together, and the proportion will be about two grains in an ear, which I suppose may be about a twentieth part of the produce, and would make a difference of at least five coomb in the crop in this field. The white wheat in this instance was most exposed to the attack of the insect,—whether this be generally the case, must be determined by future experiments upon a more extensive scale. Least mischief seemed to be done on the south side of the north hedge; but no part escaped wholly—not an ear I examined but what had sustained some injury. From this field that I have been speaking of I went to another, which was sown later in the autumn: in this I found scarcely any of the larvæ."*

Mr. Markwick, who in the first instance did not consider the wheat-midge did any serious mischief, subsequently became satisfied that Mr. Kirby's average of two grains in each ear was not too much to attribute to the operations of the larvæ, for "he scarcely examined any ears in which there were not more than that injured." In the ears transmitted to Mr. Marsham, from two to six grains were inhabited by them, and their numbers exceeded those represented in the plate (fig. 10), and in one or two he found what appeared to be a pupa. Mr. Gorrie estimated the loss in the late-sown wheats in Perthshire, in 1828, at one-third of the crop:† and the following statement, communicated by Mr. P. Bell, of Mid Lioch, and dated June 24, 1830, clearly shows the apprehensions occasioned in Scotland by its successive appearance. In alluding to the wheat-crop he says, "I found dozens of the insect busily at work depositing their eggs among the soft chaff of the young ear. We are anxious that the present cold weather should continue for another ten days, to prevent the eggs from hatching until the wheat be sufficiently hardened, and beyond the state

* Trans. Linn. Soc., vol. iv. p. 237.

† Mag. Nat. Hist., vol. ii. pp. 292 and 324.

which affords nourishment to the maggot. Another year or two of the wheat-fly will make two-thirds of the farmers here bankrupts."*

In 1841 Professor Henslow found that every field from which he had obtained specimens had been attacked by the midge, and there were larvæ present in almost every ear. A tall description of Revet wheat had particularly suffered; in one well-grown ear only nine sound grains remained, the rest had been rendered abortive by this insect, and the yield was calculated at one-third less than was expected. This is not surprising when we learn that, from the chaff and dross collected upon barn-floors in three different localities where the wheat was threshed and dressed, Professor Henslow made a calculation, by which it appears that seven bushels of the dust contained 834,952 larvæ and pupæ of the wheat-midge.†

Before entering upon the remedies suggested, it will be desirable to review the economy of the Wheat-midge; but I fear that the ingenuity of man will never devise any method for the destruction of this little rogue in grain when it has once taken possession of a standing crop. In June the eggs are laid in the ear whilst it is in flower and the incipient corn is tender; the larvæ live amongst the parts of fructification until they are full grown, after which they change to pupæ upon the sound grains and inner valves, or enter the earth to undergo their transformations; some of the flies hatching in the summer, and the majority, it is believed, in the following June.

I should expect that the early wheats would generally suffer the most, but as the attacks of the Wheat-midge are irregular and uncertain, even if the fact were established, any attempt of the farmer to avail himself of such knowledge could not be relied upon. To apply any remedy when the ears are once inoculated, I think impossible; it seems to be only in the pupa state that they can be assailed. Professor Henslow's suggestion therefore appears to be the most feasible and best calculated to check their increase, provided the larvæ and pupæ carried into the barn do not die from the artificial state in which they are placed. He recommends the use of a sieve, sufficiently open to let the pupæ and larvæ pass through with the dust, which must be removed and burnt. He says, "It occurred to me that, if a wire-gauze sieve were placed before the winnowing-machine in a sloping position, so as to allow the chaff to fall upon it and then roll from it, the pupæ would pass through, and might be caught with the dust in a tray placed below the sieve. I have put this to the test of experiment, and find it answer perfectly. Two pieces of wire-gauze were placed

* Gard. Mag., vol. vi. p. 495.

† *Vide* the Tables, &c., in Royal Agric. Journ., vol. iii. p. 38.

together at an angle, sloping like the roof of a house, and the chaff readily fell off on each side to the floor, whilst dust and pupæ passed through. If a simple contrivance of this kind formed an appendage to every winnowing-machine in the country, what myriads on myriads of the pupæ might be collected and destroyed! The researches which I have made on the subject since my report was written have satisfied me that the damage done by this minute insect is much greater than agriculturists are at all aware of." *

Sauter† gives the history of another little gnat or midge, exceedingly injurious to barley and a variety of dwarf wheat called spelt: there is every reason to believe it is a *Cecidomyia*, and he has named it

TIPULA CEREALIS—the Barley-midge.

In the grand duchy of Baden, during the years 1813 and 1816, the destruction occasioned to those crops by the larvæ of this little midge was very alarming. They are of a vermilion colour, and from 1 line to $1\frac{1}{2}$ line long: they make their appearance in May and June, living in families between the leaf-sheath and the stalk, eating the straw, which thereby becomes warty, notched and crooked, and eventually dies.

The larva, like its allies, has no feet, and is stated to be composed of nine segments, including the head and tail, both of which it is able to retract and extend, but between each abdominal ring on either side there are small hooks bent forward. The larvæ enter the earth to undergo their transformations when they are full grown.

The perfect insect, like most of its congeners, is very ephemeral, having only a few hours to accomplish its destiny, whilst the time it is passing through its transformations occupies, it appears, from two to three years. The perfect insect is brownish red, and the two wings of a silvery colour; the horns are bristle-shaped, longer than the body, and composed of thirteen joints.

Dr. Sauter, in order to destroy this pest, proposes to mow all the fields at the period when the development of the perfect insects is completed, so that the eggs which are laid and the larvæ that are hatched may both be destroyed. This remedy may be thought as bad as the disease; yet the loss might not be so great as it would at first appear, and it must effectually prevent the re-appearance of the barley-midges.

The oats of Styria and Carinthia received great damage, several years since, probably from the same or a nearly allied insect. In this instance the devastation of the oat-fields was repeated for

* Gardener's Chronicle, vol. i. p. 52.

† Germar's Mag. der Entom., vol. iii. p. 366.

several successive years, when they disappeared; which is attributed, by Kollar,* to the mowing down the infested oats whilst the insects were in the larva state.

The economy of this species bears a great resemblance to the Hessian fly, which, however, does not enter the earth to undergo its metamorphoses; and it is very remarkable that three species, so closely allied to each other, should vary so considerably in their habits. With regard to the Hessian fly, even if its presence could be ascertained in the early stages, it does not seem possible to devise any means of destroying the eggs or young larvæ, unless feeding off the blade with sheep would effect the object: and when their progress is detected by their mischievous works, at a more advanced period, nothing, I apprehend, but sacrificing the crop would arrest them. It appears, therefore, to be an evil to which we must occasionally submit; but to guard against its immediate recurrence it will only be necessary to collect and burn the stubble after the corn is reaped, by which means the larvæ and pupæ that are concealed at the base of the stalk will of course be destroyed. Kollar recommends agriculturists, as a means of prevention, to refrain from sowing wheat the following year; but whether such a system could be adopted in North America I am not prepared to say.

Summary of the foregoing Report.

Larvæ of a saw-fly called *Cephus pygmæus* destroy the rye by injuring the straw: they live through the winter, change to pupæ in March, and the flies hatch in April.

The female fly pierces and deposits her *eggs* in the *rye-straw*, or immediately below the *ear*: the *larvæ* live in the interior, piercing the knots, and about harvest time cut through the stem close to the ground, descend into the remaining stubble, and change to *pupæ*.

This insect is detected by the *ears* becoming upright and apparently ripe in the infested plants, whilst the remainder of the crop is green.

A field thus affected sometimes looks as if it had been traversed by sportsmen and animals.

This saw-fly is very abundant in corn-fields, particularly amongst barley, in June and July, in many parts of England.

It also infests the wheat-crops.

On the western coast of France this insect has caused great ravages; and similar losses have been sustained in Africa.

The *ears*, both of wheat and rye, become *steril* from the attacks the *Cephus*.

* Naturgeschichte der schaedlichen Insecten, p. 136.

To plough in *March*, or the beginning of *April*, would destroy the *larvæ* and prevent the escape of the flies; but burning the stubble is strongly recommended.

An *Ichneumon*, named *Pachymerus calcitrator*, punctures the *larvæ* which become the prey of the young parasitic maggots.

This fly is abundant, in *June* and *July*, in various parts of England.

It is doubtful if the *Hessian fly* has ever been detected in *Europe*.

In *North America* it has occasioned famine by its ravages amongst the wheat.

This fly, or an allied species, attacked the wheat-crops in *Hungary* in 1833.

Two-thirds of the straw was laid, and produced only abortive ears.

These *larvæ* lived in families between the sheath-leaf and the straw, near to the crown of the root.

The *larvæ* of the *Hessian fly* also live between the sheath and the stem, close to the base.

A parasitic fly, called *Ceraphron destructor*, keeps the *Hessian fly* in check.

Larvæ of the *British wheat-midge* detected in *July*, 1795, attacking from one to several grains in an ear.

The infested grains appeared yellow, or prematurely ripe.

They contained an orange-coloured powder and minute yellowish-white or deep yellow *larvæ*.

The same *larvæ*, Mr. Markwick says, inhabit the husks of the "wild bearded oat," *Avena fatua*.

Some agriculturists in *Sussex* formed an idea at first that the *larvæ* did no mischief to the corn.

The *Wheat-midge* was very abundant the middle of *July*, 1797.

These flies had spotted or rather obscurely clouded wings.

The *larvæ* were exceedingly abundant later in the season, but very few pupæ were found.

One of the flies was bred in *September*, but they probably do not generally hatch till the spring.

As many as seven or eight florets in an ear inhabited by the *larvæ*, and as many as thirty in a single floret.

The pupæ never found within the florets where the *larvæ* resided.

Parasitic *Ichneumons* destroy the greater part of the *larvæ*.

The *larvæ* feed upon the pollen, and the germen never swells.

In *June*, 1798, there were innumerable hosts of the female *Wheat-midge*, but not any males: twelve at one time were laying eggs in a single ear.

They begin to fly about seven in the evening and disappear about nine o'clock.

They may be found in the *morning* by shaking the corn, and will then fly about the ground.

The female deposits her *eggs* between the *valvules* of the *corolla* by means of her long *ovipositor*.

Patches of the *eggs* found the 7th of June; on the 17th the *larva* was newly hatched.

This or a similar species has been *detected in France*.

In August, 1840, I found the *larvæ* enclosed in their *cases* upon the grain in Suffolk; which was also affected by red-rust.

All the *cases* were *fractured* at the head, as if the *larvæ* had attempted but failed to make their escape.

They *voluntarily left* their *cases* and died.

In January, 1841, they were *abundant* in the *dust*, after winnowing the wheat.

The skins or *cases* enclosing the *larvæ* adhered to *sound grains* and the *chaff-scales*.

Some *quitted the ears* and buried themselves: had these been punctured by a parasitic *Ichneumon*?

It seems evident that they *lie* in an *inactive* state during the *winter*.

Very desirable to ascertain if the *larvæ* enter the *earth* to become *pupæ*, and under what conditions.

Where do the *parent midges* come from which deposit the *eggs* in the *standing corn*?

It is possible the same *species* may inhabit both *corn* and *grasses*.

The *Wheat-midge* has been observed in *Scotland* and *Ireland*, as well as in a great many counties of *England*.

In *June*, 1842, I found both the *Wheat-midge* and its *parasite* in *Dorsetshire*.

Nearly *thirty species of Cecidomyia* have been found in this country, and they vary greatly in their economy.

Three different parasites check the multiplication of the *British wheat-midge*.

Five coombs calculated as the loss in a field of *fifteen acres*.

At least *two grains* in each *ear* injured by the *larvæ*.

In *Scotland one-third* of the *crop* was lost, and the farmers suffered severely, in 1828 and three following years.

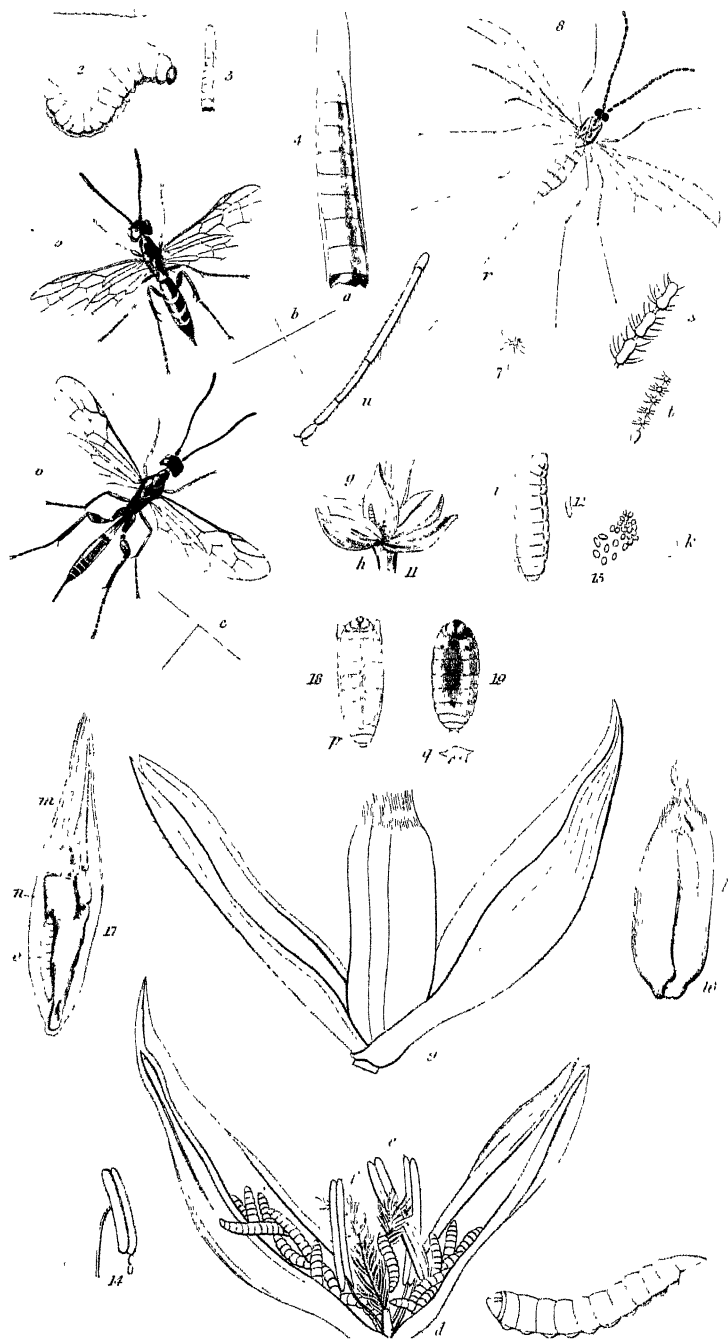
In *Suffolk the yield* of wheat was *one-third less*, in some districts, in 1841 than was expected.

The *larvæ* were found in *myriads* in the *dust* from the chaff and dross of the wheat.

Probably most readily *extirpated* by means of a *sieve* to be used in winnowing, to separate the chaff from the *pupæ* and dust.

Tipula cerealis injurious to *barley* and *spelt*.

The *larvæ* live in families between the *leaf-sheath* and the *stalk*.



To destroy this species mow the fields when the perfect insects hatch.

The oat-crops in *Styria* and *Carinthia* were similarly attacked for several successive years.

The mischief was at last arrested by mowing the infested oats whilst the larvæ were in them.

Possibly feeding off the wheat with sheep might save the crops from the *Hessian fly*.

Collecting and burning the stubble would destroy the larvæ and pupæ of this insect.

Kollar recommends the German farmers to abstain from wheat-sowing for a year after the midges have been abundant.

EXPLANATION OF PLATE M.

- Fig. 1. Larva or Maggot of *Cephus pygmaeus*.
 Fig. 2.* The same magnified, in a different position.
 Fig. 3. Pupa or *Chrysalis* of *Cephus pygmaeus*.
 Fig. 4.* The same magnified.
 a The operculum formed of excrement, &c.
 Fig. 5.* *Cephus pygmaeus*, the female.
 b The natural size.
 Fig. 6.* *Pachymerus calcitrator*, the female.
 c The natural size.
 Fig. 7. *Cecidomyia tritici*, the female British wheat-midge.
 Fig. 8.* The same magnified.
 r The ovipositor.
 *s** Three joints of the female antenna.
 *t** Six of the basal joints of a male ditto.
 *u** Hinder tarsus or foot of the wheat-midge.
 Fig. 9.* Represents the germen or young grain of wheat nearly complete, with two of the valvules which enclose it.
 Fig. 10.* Is a flower expanded from the same ear, showing the effects of the little larvæ which had taken up their residence in the corolla.
 *d** The germen scarcely at all swelled.
 *e** The stamina of their usual size.
 *f** The styles ditto.
 Fig. 11. Represents a grain of wheat with the chaff and valvules opened.
 g The larva of *Cecidomyia tritici*.
 h The red-rust, at first taken for excrement.
 Fig. 12. The larva removed.
 *i** The same magnified.
 Fig. 13.* One of the larvæ from the group in fig. 10 greatly magnified.
 Fig. 14.* A newly-hatched larva adhering to the lower end of one of the anthers; vide fig. 10 *e*.
 Fig. 15.* A group of the granules magnified.
 *k** One of them highly magnified.

Fig. 16.* A sound grain of wheat with the larva attached.

*l** The larva in its transparent case.

Fig. 17.* A shrivelled grain of wheat with the larva attached.

*m** The valvule.

*n** The shrivelled grain.

*o** The larva attached in its transparent case.

Fig. 18.* One of these larvæ detached.

*p** The apex of the transparent skin or case.

Fig. 19.* The dead larva removed from its case.

*q** The toothed tail.

Obs.—Those numbers and letters with a * attached refer to the objects which are represented larger than life. All the figures are drawn from nature, excepting Nos. 1, 2, 3, and 4, which are copied from Guerin's Memoir; 9, 10, 13, and 14 from the Linnæan Transactions, and fig. *t* from Meigen's Diptera.

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Hayes, near Uxbridge, April, 1845.

XII.—On One-Horse Carts. By EDWARD BOWLY, Siddington, near Gloucester.

PRIZE ESSAY.

HAVING had five years' practical experience in the use of waggons, and nearly the same time of one-horse carts, on a farm of 170 acres of arable and 80 acres of pasture land, I have arrived at a satisfactory conclusion as to the comparative advantages of the latter. I will, as briefly as possible, point out what I consider to be those advantages.

We must first consider the saving of capital in entering a farm by employing one-horse carts instead of waggons. From the great variety of soil it is difficult to form a just estimate of the amount of horse-power required to cultivate a given quantity of land. We may, however, to a certain extent do so by taking for our purpose land of medium quality, of which description my own farm consists. I have no light ploughing land, nor have I more than 20 or 30 acres of very heavy land. I will, therefore, relate my actual experience. In the employment of waggons and the old broad-wheeled dung-carts, I required one waggon, one cart, and three horses to every 50 acres of arable land. I also kept a light cart for general purposes. Now that I am employing carts, I find that I get through my work much more easily with two horses and two carts to 50 acres. The following is a fair calculation of the first outlay under the two systems:—

	£	s.	d.
1 waggon	25	0	0
1 dung-cart	15	0	0
3 horses	60	0	0
Extra harness	2	0	0
Proportionate cost of the light cart to 50 acres .	3	0	0
	<hr/>		
	105	0	0
	<hr/>		
	£	s.	d.
Two 4-inch wheel one-horse carts	24	0	0
Two horses	40	0	0
	<hr/>		
	64	0	0
Balance in favour of carts	41	0	0
	<hr/>		
	105	0	0
	<hr/>		

This shows a saving of upwards of 16s. an acre, which many young farmers would find extremely useful to expend in stock or implements. There is also some annual saving in the expense of the repairs under the cart system, as well as that of the keep of one horse to every 50 acres. I believe there are those who think this of little importance; that they can keep horses at a very small expense, say from 3s. to 5s. per week; and that if fewer are kept, they must be fed more highly, and therefore the cost is much the same, forgetting that the more horses are kept the greater number of hands are required to attend them, whose time also is wasted if the animals are not in a state to do a good day's work; nor is the manure nearly so valuable as when the horses are kept in a better state. To estimate the saving of keeping one horse less to 50 acres, I will make my calculations from my own method of keep. I have not for years allowed my horses any hay. In winter I give them 10 lbs. of corn, 10 lbs. of carrots or swedes, and as much straw-chaff as they will eat, per diem. The corn I value at 6s. per week, the roots at 9d., and the straw with expense of cutting into chaff 1s. 3d., making in the whole 8s. per week, which, with 1s. for shoeing, &c., amounts to 9s. In the summer I give them green clover or vetches, without corn, which I value at 5s. per week, making 6s., with 1s. added for shoeing, &c.; the average therefore for the whole year will be 7s. 6d. each horse. It therefore follows that if we can save one horse in the cultivation of 50 acres, it will amount to nearly 8s. per acre.

I will now proceed to the working of the system. It is, I believe, generally admitted that one horse attached to a given weight, will move it more easily than two horses attached to double that weight. This arises not only from the advantage gained by hav-

ing all the power of draught close to the work, but also all the power applied at the same moment, which is almost impossible where two or more horses, having different wills and steps, are attached to the weight; and for the same reason one horse will travel more quickly singly. I have often heard it remarked as teams have passed "how well the horses pull together," when, perhaps, they have been moving at something less than two miles an hour; but hasten them to four miles an hour, and this steady working team will draw very uneasily, one horse pulling to the right hand, another to the left; therefore a great saving of time is occasioned in the quickness of motion with one-horse carts. When a cart is filled there is no delay in attaching the trace-horses, during which operation the one horse would be two hundred yards on the road. I know this might be done more quickly by having men ready to change the horses, as is the practice of opposition coaches, but I am speaking of the matter-of-fact working of the system. Then again, when the load is deposited, the one horse turns in much less time than the two or three. These facts are too self-evident to admit of contradiction; indeed, I believe the economy of carting manure with one-horse carts is generally allowed, but the employment of them in harvesting is much objected to. In this respect, however, I find them equally expeditious and economical. My actual experience is that three carts, with the harvest frames attached, will convey as much hay or corn in the straw as two waggons, and that they are bound with the ropes in the same time, therefore no time is lost in binding. They are easier to pitch to than waggons, and not more difficult to unload; and all the advantages are gained of speed in travelling.

The facility with which carts are set to a rick, as compared with waggons, will effect a much greater saving of time than in working from a heap of manure; you can also draw the carts to all sides of the rick, thereby avoiding the inconvenience of drawing your rick aside by the great treading there generally is on the side on which you unload the waggons, the usual practice being to unload all on one side, from the waggon being too unwieldy in turning to be set at the other sides. My system in carrying a field, what we call "double handed"—that is, with two pitchers and two loaders—is to commence with one cart, having one pitcher and loader, and when that is half loaded to start another with the other pitcher and loader. When the first is filled it goes to the rick, and is followed by the others in succession: by commencing in this way we keep on regularly through the day, having two carts loading in the field and two unloading at the rick, and the number of carts employed in going to and fro must be regulated by the distance of the field from the rick; if very near, one will be sufficient, and more than two are seldom required on any farm

of moderate dimensions. I conceive it would not be generally useful to mention the time occupied in securing a given number of acres of corn with carts, as so much depends on the bulk of the crop, as well as the power of the men employed. I once accurately remarked the time of such an operation: it was in carrying a very heavy crop of 10 acres of *mown* wheat close to the homestead, which took with five carts four hours and a quarter from the first cart entering the field to the finishing off the rick with the last. The longer the distance of the field from the rick the greater will be the advantage of carts. Supposing each waggon to be drawn by two horses (three are frequently employed), and that three carts will convey as much as two waggons, which I am certain will be more than borne out in practice; then three horses will take as much in the carts as four in the waggons, and they will perform the distance in little more than half the time. It is supposed that an additional expense attends carts in the number of boys required to go with them: this is not the case; the boys are younger and less expensive than those intrusted with waggons, and the horses do not need any boy in the field, as when they become accustomed to their work they will walk steadily beside the cocks without being attended. There is an impression that carts will not answer in hilly situations; we find, however, they are employed, to the exclusion of waggons, in some of the most hilly counties of England. I have certainly nothing very steep on my farm; but 50 acres lie nearly two miles from the rest of my land, on which road there are two very sharp pitches, up and down which I am constantly taking loads, and have never found more inconvenience with carts than I formerly did with waggons. But, to prevent any possibility of accident, there is now to be had the self-acting drag, which retards the wheels in proportion to the descent; there is also a very simple method of moving the load forward by means of a screw when going up hill, and backward in descending a hill. But I have found the carts I have answer so well without these additions, that I shall not go to the expense of either of these improvements at present. In taking out corn in the sacks, carts will be found far preferable to waggons, as in all the other operations carrying a greater weight with the same ease and in less time, each cart carrying 5 quarters of wheat. Nearly the whole of my wheat goes to a mill seven miles distant, on the road to which there are three steep hills. I always send two carts, carrying 5 quarters of wheat each, with one lad of eighteen or twenty, going twice a-day; and in summer, when the roads are very good, I have put $5\frac{1}{2}$ quarters behind each horse: thus two horses would deliver 22 quarters in a day.

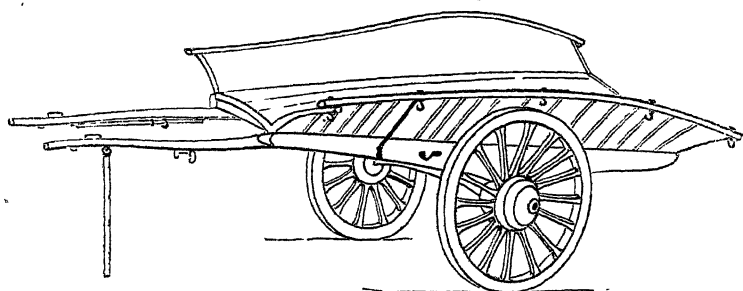
I have endeavoured to answer all the objections I have heard

used against one-horse carts, objections which I once strongly felt myself. My attention was first drawn seriously to the subject from hiring a man to draw some stones for draining. He came with a horse only 14 hands high and a small cart, when the work he accomplished so surprised me, that I at once decided to try two light carts, which, after succeeding well in all other operations, I employed in the harvest field; and being fully satisfied with them in this capacity, I soon discarded every waggon from the farm.

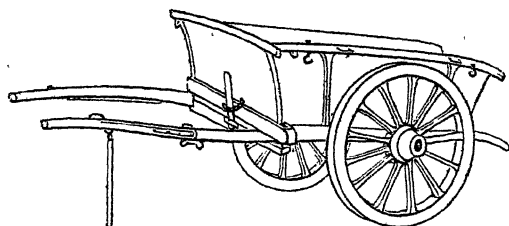
I have carefully endeavoured to give a just estimate of the saving in horses and implements by the use of carts; since they were first employed by me I have effected a greater reduction in the number of each than is here represented. When I kept waggons I had not so much land by 20 acres in cultivation as at present; I then kept ten horses, four waggons, three dung carts, and one light cart; I now only keep six carts and six horses. I, however, attribute a portion of the saving to the use of the scarifier in many instances instead of the plough, and I now very rarely put more than two horses to a plough, while at that time I frequently had three; on the other hand, for two years past, I have each year carted 150 loads of night-soil a distance of a mile and a half, and 300 loads of road-scrappings, &c. half a mile, which is two-thirds more than I did during the time I had waggons. I have also done each year the following extra work:—carted 30 tons of potatoes two miles, 60 tons of roots half a mile, subsoil ploughed 6 or 7 acres, and carted stones for 15 acres of draining 30 feet distant. I have therefore taken all these things into due consideration, and given the fairest representation in my power.

The description of carts I make use of are, five common Scotch carts and one skeleton cart; those of the former, with narrow wheels, cost me 10 guineas each; and with the 4-inch wheels (which I recommend) 12*l.*, with harvest-frame, &c. complete. The skeleton with narrow wheels cost me 10*l.*; it will carry more hay or straw than the others, its loads being in proportion of four carts to three waggons—it is more convenient for conveying poles, hurdles, &c.; and one on a farm may be useful, but it will not answer in dung-carting, and its advantages in harvesting are not sufficient to remunerate for the additional outlay of a double set.

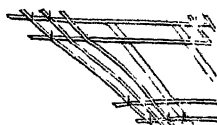
In conclusion, I may remark that the principle of one-horse carts is quickness of motion, therefore load according to the road to be passed over, but never reduce the pace of travelling; and I can assure those who are timid about them, that they are much less liable to accidents of every kind than waggons; and that, however prejudiced the workman may be against their first introduction, when he becomes acquainted with the system he will prefer it.



Skeleton Cart.



Scotch Cart.



Harvest Frame.

XIII.—On the Prevention of Curl and Dry-Rot in Potatoes. By H. S. THOMPSON.

To Ph. Pusey, Esq.

MY DEAR SIR,—The prevention of curl and dry-rot in potatoes is a problem the solution of which is important to every occupier of either farm or garden, and I therefore trust that you will not consider any apology necessary when I request the insertion, in the Journal of our Society, of the following paper, which contains the result of my observations and experiments on this subject for the last five years. I will first mention the result to which I have been led, and then enumerate the facts and state the reasoning which to my mind make such a conclusion inevitable. The result, then, at which I have arrived is, that curl and dry-rot are caused by leaving the potatoes intended for seed in the ground until ripe, and that, on the other hand, these diseases may be prevented by taking up the seed-potatoes whilst the tubers are unripe, and the tops still green.

1840.—In the spring of 1840 I planted 16 acres with potatoes; and having, for some previous seasons, had my attention strongly

drawn to the failures in the potato-crop which had caused so much discussion in Scotland and elsewhere, I paid more than ordinary attention to the selection of seed in this instance, and made choice of two kinds of round red potatoes, both of which were quite new to my land. One of them had been procured from Messrs. Drummond, Stirling, in 1835; the other from Messrs. Lawson, Edinburgh, in 1837; and the gentleman who had grown them in the intervening seasons, having two farms, one of stiff, the other of light land, had changed his sets regularly from one to the other. He spoke highly of both kinds, and when boiled they were mealy and good: one kind, however, more so than the other. The land on which I planted them, a sandy loam lying near the rock (geological formation—new red sandstone), was in a high state of cultivation, having had a heavy crop of swedes consumed on the land by sheep, the property of the off-going tenant; and my reason for planting it with potatoes was solely because I was aware that if sown with corn it would be so lodged as to be nearly worthless. I naturally anticipated a heavy crop. They were planted in the last week in April, the season remarkably favourable; and I was much disappointed to find that the braird was weakly, and soon showed symptoms of curl. This increased, and though few of the plants perished, nearly the whole were unhealthy. I particularly noticed that the kind of potato which had been the most mealy when boiled suffered most from the curl; and though, from the great richness of the land, they grew, and gave a produce greater than could have been expected under the circumstances, it was decidedly a failing crop. I was so much surprised at the appearance of curl that I watched and examined the plants at several periods of their growth, taking up roots here and there wherever I observed one either better or worse than its neighbours. The appearance of all those affected was nearly the same. The set, as long as the weather was dry, crumbled and perished—the disease seeming to proceed from certain spots or pits as centres, and gradually destroying the whole set. The cut sets were the worst, and the decay always commenced from the cut side of the set, but the whole ones also suffered. As soon as the weather became wet, these appearances changed, and the diseased portion of the set resembled a brown sponge, which after a short time became black and offensive. The effect on the plant was well marked. Wherever the disease had made a decided impression on the set, the stalks of the plant were marked with brown streaks and patches, and evidently showed that the juices which they were conducting from the set were vitiated and noxious. The part of the stalk to which I directed my attention was that underground, in which it was easy to trace the progress of the disease, from their being white and

nearly transparent. Wherever the top was curled I found the stalks unsound and the set diseased. In some cases the disease carried the day, and the set reaching an advanced stage of decomposition, and the stalks below-ground becoming quite brown, the top died away. In a subsequent season (1844) most of the sets attacked perished; but on this occasion a very great majority of the plants threw out strong roots, and finding an abundant supply of food, maintained a constant struggle with the disease, and eventually yielded a good half crop. A few green healthy plants stood prominently out amongst the brown half-withered tops of the rest; and on examining these I found them to be plants of a white potato (known by the name of "Cheshire white"), a few chance sets of which had been accidentally mixed with the rest. These white potatoes had been previously in use for the table, but were very inferior, in point of mealiness, to the red ones selected for seed. The experience of this season convinced me that curl, dry-rot, and wet-rot, are one and the same complaint; that curl is a mild attack of the disease, which, when violent, destroys the set before it can germinate; and that it assumes the form of dry or wet rot according to the degree of moisture of the soil or season. I have repeatedly seen potatoes affected with dry-rot in a few days assume the appearances by which wet-rot is usually described; and this change was evidently attributable to heavy rain which had fallen in the interval. The autumn of 1840 was remarkably fine; and being anxious to take advantage of it I began to take up my potatoes as early as the 2nd of October, before they were ripe, and when, for the most part, they would not bear handling without what is provincially called "*slipping their skins*."

1841.—As I still considered the red potatoes above-mentioned to be of good kinds, and that the occurrence of curl was accidental, I determined to give one of them another trial; and accordingly, in 1841, I planted about an acre and a half with sets from the crop of 1840 which had suffered so much from curl. They were planted as late as the 8th of June, the land having been previously sown with lucerne, which had failed; the weather dry and unfavourable: yet, in spite of these disadvantages, they came up perfectly well, grew luxuriantly, and produced an excellent crop. Side by side with these potatoes two other kinds were grown: one a black kidney, a very superior potato for the table; the other a cattle potato called the mangold wurzel. These were bought sets, nor do I know how they had been previously treated. Both, however, were failing crops. The experience of this season is valuable, running, as it does, directly counter to what has been so frequently asserted by the best authorities, viz., that curl is sure to increase, and that curled sets are to be avoided like the

plague. The explanation of the rule and of this exception to it appears to me to be as follows:—Curled potatoes ripen early, some weeks before the healthy plants, and consequently are almost always too ripe when taken up to make good sets, and if so used the disease will rapidly increase each successive season. In this instance, however, the infected potatoes were taken up before they were ripe, and proved to be as good sets as could be used. To proceed. The potatoes above-mentioned were taken up the second week in November, 1841. Having been planted so late, the round reds were not ripe; the black kidneys, a much earlier variety, were.

1842.—These potatoes were used for seed in 1842. The unripe reds produced an excellent crop, without, as far as I am aware, a single failing plant. The ripe black kidneys were again a failing crop. In the middle of May of this year (1842) I planted with these black kidneys a small piece of old grass-land, as a preparation for forest-trees. This plot of ground had been from time immemorial flowed over by the waste water from an old and ill-constructed farm-yard immediately adjoining, and was therefore as rich as could well be imagined. The potatoes had immense tops, but very small tubers; and, when boiled, the favourite black kidneys seemed quite to have changed their character. Instead of the firm mealiness for which they are remarkable, they now bore much more resemblance to a piece of yellow soap. They also continued growing till the frost and snow made it dangerous to leave them any longer in the ground, and they were taken up still thoroughly unripe. The round reds, grown on old-going land, were taken up ordinarily ripe, and were mealy and good.

1843.—In 1843 these two kinds were again used for seed, and the ripe reds had numerous failures, but the unripe black kidneys were as even and vigorous a crop as could be wished. I had not yet learnt to attribute the failure to its right cause, and was accordingly much puzzled to account for the curl among the round reds, which had thriven so well the two previous seasons. I was absent on the Continent during the autumn of 1843; but my bailiff informed me that, in consequence of a heavy fall of snow in October, he took up the potatoes earlier than he intended, and that the red potatoes were not ripe, but that the black kidneys (a capital crop) were.

1844.—It was not till the spring of 1844 that I became convinced that the maturity of the potato intended for seed materially affected the vigour of the future plant; and the crop of that year furnished me with some facts strongly corroborative of this opinion. The ripe black kidneys again failed to a great extent: not less, I think, than half the sets perished without

vegetating, or only showed puny curled tops, and died without forming tubers larger than peas. The unripe reds were planted in a particularly unfavourable place, viz, an old lane which had been just added to an adjoining field, and was so hard and dry that parts of it had to be broken up with pickaxes. In consequence of the long drought the planting was delayed for several weeks in hopes of rain, but as none came they were put into the ground as dry as dust, and planted without manure: no rain, with the exception of a slight shower, fell till the potatoes were up. Still in the whole of the piece, rather more than an acre, I could not discover that a single plant had failed, and the braird was uniformly strong and healthy. It will be well to present these results in a tabular form. I shall assume that the red potatoes bought in 1840, and the black kidneys in 1841, had been taken up ripe; and their mealiness will justify such an assumption, as unripe potatoes are always watery, and unfit for the table.

ROUND REDS.

Year.	Seed taken up.	Quality of Crop.	Quantity of Crop.
1840	Ripe (supposed).	Curled.	Failing crop.
1841	Unripe.	No curl.	Good crop.
1842	Unripe.	No curl.	Good crop.
1843	Ripe.	Curled.	Indifferent crop.
1844	Unripe.	No curl.	Good crop.

BLACK KIDNEYS.

Year.	Seed taken up.	Quality of Crop.	Quantity of Crop.
1841	Ripe (supposed).	Curled.	Failing crop.
1842	Ripe.	Curled.	Light crop.
1843	Unripe.	No curl.	Capital crop.
1844	Ripe.	Much curled.	Very bad crop.

Had the above results been obtained by experiments contrived for the purpose, they could not have borne more directly on the point in question, as we find that in the wet summer of 1843, and the extraordinary drought of 1844, as well as in the average seasons of 1841 and 1842, it accidentally happened that part of my potato crop was grown from ripe and another part from unripe sets, and in every case with success from the one and failure from the other: thus showing that the seasons could not be blamed as the cause of curl. To make these instances still more conclusive, it also happened that each of the two very different kinds of potatoes named were alternately affected by or free from curl: thus

showing that it was not a peculiarity belonging to a particular kind of potato.

Thus far I have detailed my own experience only; but when it first occurred to me that over-ripening of the set was the cause of curl, I naturally became anxious to compare the experience of others with my own, and made many inquiries on the subject from other potato-growers. The information I thus received still more strongly confirmed me in my previous opinion, and I select one or two of the cases which appear to me most in point. The first I shall bring forward gives the result of two opposite methods of treating potatoes intended for seed, as practised by two men living in the village of A., near York. I inspected both their crops at the time that they gave me the following statement:—

“J. C., gardener to Admiral P., has planted the same kind of ash-top kidney for more than ten years. The first year or two he took up those intended for seed at the same time as those intended for consumption; but found that they grew so much during the winter that they were obliged to be sprouted twice, which weakened the set so much as to injure the crop. He then tried the effect of leaving them longer in the ground—sometimes as much as three months after the plant was ripe. This produced the desired effect of preventing the growth during winter; but after some years’ continuance he found the germinating power so much injured that they were a month or more later in coming up than those of his neighbours, treated in the ordinary way. In fact, he could scarcely get them to grow at all, and should be forced to change his plan.”

“J. T., a labouring man, has grown ash-top kidneys for some years, and finds them better and earlier than when he first got them. Is in the habit of planting those he intends for sets after taking up his crop of cabbages, which is at the end of June or beginning of July. He also takes them up before they are ripe; never finds them fail; they grow earlier in spring than potatoes not so treated, and make stronger and healthier plants. People frequently come to him for sets.”

The contrast between these two instances is very complete. Two men, living not above two or three hundred yards from one another, and whose gardens, as far as I could judge, are precisely similar in quality, grow the same kind of potato in the same seasons. J. T.’s potatoes, being taken up unripe, improve both in vigour and early maturity—a great merit in this variety; whilst C.’s, which are left in the ground till over-ripe, will scarcely grow at all.

I will next instance the township of Sawdon, near Scarborough, which some years ago supplied large quantities of potatoes for seed to the warp-land districts in the neighbourhood of Selby. J. C.

of Sawdon has been a potato-grower for more than thirty years; used formerly to send 500 or 600 bushels of Sawdon kidneys annually to Selby, where they were used for seed, and the produce sent to London; used to grow as many as 200 bushels to the acre, now considers 50 bushels a good crop; has failed so repeatedly in the last five years in growing a crop that this year (1844) he has none; believes there is no one in the township who continues to grow the kidneys except one old man of the name of H. The township of Sawdon has been enclosed, planted, and other improvements made, within his recollection. H. of Sawdon Moor has occupied a few acres of land reclaimed from the moor for twenty-two years, and has grown Sawdon kidneys the whole time, and always in the same field! Only about one-third of it, however, is in potatoes at once. My informant adds that H. considers his potatoes are ripe when he takes them up, but he (informant) does not consider them as ripe as his neighbours; and when the elevation, exposure, and cold wet nature of the soil that he farms, are taken into account, it seems probable that his potatoes are seldom if ever thoroughly ripened. In the case of Sawdon we have no direct evidence that the failure of the once famous Sawdon kidneys is to be attributed to over-ripening of their seed-potatoes, but the probabilities are strongly in favour of this supposition. In the first place, the potato itself, like all the kidneys, ripens early; and in ordinary situations would, if taken up at the usual time of potato-harvest, be too ripe to make good seed, and this is *now* found to be the case at *Sawdon*, and its growth is abandoned; but in former years, when the township (which borders on the moorlands, and partly consists of what farmers there call "wet clayey gravel," partly of black peaty soil) was unenclosed, undrained, and without shelter, the climate was sufficiently backward to make the "kidneys" immature when taken up, and consequently to be held in high repute, and sent to great distances for seed. It may be urged that the failure may with equal probability be attributed to the gradual deterioration of this species of potato; and to meet such an objection I have inserted the case of H. mentioned above, who still grows, with profit to himself and advantage to his neighbours, the identical species supposed to be worn out, and moreover has grown it every third year on the same soil for twenty-two years, and in the same township where it had been previously grown time out of mind.

I will now state the chemical facts which appear to me to confirm and explain the above-mentioned results of practice. It is notorious to potato-growers that a marked change takes place in the quality of the tuber when the stem and leaves wither, and that potatoes taken up when the plant is still growing are invariably watery, though a portion of the same plot, if of a good sort

and in suitable soil, taken up a few weeks later, will be found light and mealy. This is probably owing to the deposition of starch in the tuber by the descent of the sap when the growth of the plant has ceased, and is apparently analogous to the very similar process described by Professor Liebig* as taking place in all perennial plants. "All the carbonic acid which the plants (speaking of perennials only) now absorb is employed for the production of nutritive matter for the following year. Instead of woody fibre, starch is formed, and is diffused through every part of the plant by the autumnal sap." To remove every doubt on the subject, however, I took up portions of two kinds of potatoes growing in very different situations, and sent a ripe and unripe sample of each to Mr. Spence, analyzing chemist, York, merely numbering the samples, and requesting to know the per centage of starch in each. The result was as follows:—

	Water.	Starch.	Remainder, consisting of dry fibre, &c.
No. 1. Black kidneys, unripe . . .	68·7	17·7	13·5
No. 2. Ditto, ripe	72·0	17·9	10·0
No. 3. Round reds, unripe	69·8	15·1	15·0
No. 4. Ditto, ripe	73·8	17·9	8·2

The proportion of water in the unripe samples here seems to be about 4 per cent. less than in the ripe samples, but this was probably owing to the unripe samples having been taken up some weeks earlier, and kept out of the ground until the others were considered ripe enough. If this were taken into account, the increase of starch in the interval would be still more marked. As it stands, however, the altered proportions of the principal constituents are remarkable. Neglecting the water as unconnected with the present inquiry, we find that the proportion of starch to the other solid matters is as 177 : 135 in the unripe kidneys, but as 179 : 100 in the ripe; or reducing both to a common measure, we have—

Starch : other solid matters : : 131 : 100 in the unripe kidneys.
: : 179 : 100 in the ripe ditto.

In the round reds, reducing as before to a common measure —

Starch : other solid matters : : $100\frac{2}{3}$: 100 in the unripe reds.
: : $216\frac{1}{3}$: 100 in the ripe ditto.

In each case it thus appears that the proportion of starch to the other solid matters had increased considerably in the interval which had elapsed between taking up the ripe and unripe parcels. The remark will here be probably made, that though an increase of starch has undoubtedly taken place, yet the quantity present was considerable before, why then should an addition to it injure the germinating power of the set? To answer this question it is

* Organic Chemistry of Agriculture, p. 124.

necessary to state briefly the doctrine propounded by the most eminent vegetable physiologists of the present day, who affirm that during the act of commencing germination a substance called "diastase" is generated from the nitrogenous substances contained in the germinating seed, which diastase assists in the conversion of starch into the gum, sugar, &c., which are required for the nourishment of the young shoot. The potato contains a very small per centage of nitrogenous matter. I would, therefore, venture the suggestion that the great addition made in the process of ripening to the already large stock of starch contained in the tuber may be more than can be converted into gum, sugar, &c.; by the small quantity of diastase generated in the germinating potato. If this be the case, then it would follow that the diastase being mixed with too large a proportion of starch (like leaven mixed with too large a proportion of dough) only does its work imperfectly, and the result is a weakly shoot, whilst a portion of the starch, failing to receive the vitalizing influence of the diastase, undergoes the natural course of decay, and produces the symptoms peculiar to dry-rot, wet-rot, or curl. This supposition is, of course, pure theory, and must not be confounded with the facts on which it is based. To make it quite clear where the one ends and the other begins, I will very briefly recapitulate. Facts have been brought forward to prove that ripe sets are subject to curl, and *vice versâ*, also that a large addition is made to the quantity of starch in the potato in the process of ripening. Direct experiment also proves that "diastase" is required for the germination of seeds, which diastase can only be formed from some substance containing nitrogen: potatoes contain a very small proportion of such substances, and therefore can have but very little diastase. Here our facts end, but from these premises I would hazard the deduction that if we allow our seed potatoes to ripen they acquire more starch than can be made available to the growing shoot; which excess naturally decays, and then infects and injures, or even destroys, the plant with which it is connected. A similar effect is produced in the human subject when more food is taken into the stomach than the gastric juice is able properly to digest. The imperfectly converted aliment produces inconvenience of various kinds, and, if persevered in, derangement of the whole system, though the food itself in moderation may be perfectly wholesome.

It would be doing injustice to the theory above stated, if it were sent forth to the public without a brief notice of some of the objections which will at once occur to those conversant with the subject. The first that I shall allude to is that the management of seed potatoes during winter, the mode of planting, and more especially the nature of the season after planting, exercise a

very decided influence in modifying or increasing the potato failure; which, at first sight, seems hardly reconcilable with the supposition that such failure is dependent on the degree of maturity of the seed potatoes when harvested. I at once admit that if seed potatoes are kept in too large a heap and allowed to ferment, or if kept so warm as to induce excessive growth during winter, or in any other way are so treated as to weaken their vitality, the sets will many of them fail, and others make weak and unhealthy shoots, very much resembling, and possibly identical with, curl. It must be borne in mind, however, that though I consider overripening of the seed to be the ordinary cause of curl, I by no means assert that it is the only one. I am well aware that deficient management will, especially if followed by long drought, produce failing crops, and whether such failure is due to curl or not I can offer no opinion; but the great puzzle to potato-growers has been that, with the most careful management, failures continually occur, and these failures may, I think, be generally traced to ripe sets. That the influence of season is great I should be the last man to deny, as in two instances where my potato crops were affected with curl (distinctly traceable to having used ripe sets) they continued to get worse so long as the drought lasted, but on the occurrence of heavy rains they improved very much; and this is quite in keeping with my theory, as when once the plant has a stem and leaves whereby to elaborate nourishment from the atmosphere, and roots which purvey from below, a large supply of moisture will give it such an abundant flow of sap that the vitiated juices of the decaying set will both be very much diluted and the plant will derive sufficient vigour from external sources to outgrow a slight ailment; whereas in a drougthy season, the plant is much more dependent on the set, and this at such a time furnishes the poison in a concentrated form.

The next objection I shall notice is, that one of the best ways of getting rid of curl hitherto known is to grow the potatoes intended for seed on a piece of old meadow or other land that has been long uncropped. This is easy of explanation. Fresh land contains a supply of food which has been accumulating for years, and accordingly produces a more luxuriant growth and later maturity. Every one must have remarked that in a dry season plants of all kinds are less fully developed, but ripen earlier. This is doubtless owing to the less liberal supply of nourishment which they receive; for even where the land is abundantly manured plants cannot avail themselves of it without moisture. When a plant has attained a certain stage of growth, even though considerably below its ordinary development, should its supply of food be stinted, either in consequence of drought, or of a scarcity of the necessary elements in the soil, it will at once proceed to

form and mature its seed. This is readily observable in the case of weeds. The same species of grass which is common in our meadows will be frequently found growing by a roadside, or even on a gravel walk, and in dry weather will flower and bear seed, though so stunted and dwarfish as scarcely to be recognizable. This will occur considerably earlier in the season than the time of ripening of the same species of grass in an ordinary meadow, and again the meadow-grown plant will ripen far before another of the same species grown by a ditchside or in other moist rich soil, and this last will as much exceed the meadow plant in size and luxuriance as the one in the meadow did the one on the gravel walk. The *Poa annua* is a species of grass which may frequently be found in all the three situations above named. That potatoes are not exempt from this law of nature I have had abundant proof. On the occasion previously mentioned, where I planted potatoes on a piece of rich old turf, soaked for years with the drainage of a farm-yard, they never did ripen, but grew on through the whole autumn, and were as green and vigorous in November as they had been in July. At last a heavy fall of snow came with a severe frost, and in forty-eight hours they were as black as if they had been burnt, but the tubers were still thoroughly unripe, and were the very worst on the table, and made the best sets that I have ever possessed. In 1844 I had also a strong instance. In reclaiming an old lane some parts had to be lowered and some hollows to be filled up, and both being planted with potatoes at the same time, those planted where the old hollows had been, and which now had a considerable depth of fresh soil, grew considerably taller and ripened some weeks *later* than those on the ridges whence the soil had been taken; though even in these places considerable pains were taken to retain as much of the surface soil as possible: and as the ridges and depressions ran parallel to each other for forty or fifty yards together, the marked difference in the time of ripening caught the eye at once. I have also frequently observed that potatoes planted near hedgerow trees (especially ash) ripen earlier than the rest of the field. This can only arise from the abstraction of manure by the roots of the ash, which are fibrous and run near the surface. It thus appears, as well by the analogy of other plants as by direct observation of the potato itself, that a deficiency of nutriment produces early maturity, and *vice versâ*. Fresh soil, it will at once be admitted, contains an extra supply of food; potatoes, therefore, grown on such soil will be in a growing state when those on old-going land will be quite ripe, and if harvested together the former will be unripe and make good sets. It is very probable, however, that the more abundant supply of all the elements of nutrition to be found in fresh soil may have a con-

siderable effect, and concur with the under-ripening of the seed in producing a healthy and vigorous plant.

The last objection is one which has already proved fatal to several theories that have been brought forward to account for the potato failure, and may be briefly stated as follows:—"We planted, we manured, we harvested our potatoes fifty years ago much as we do now, except that the whole was then done in a more careless, haphazard way; yet we were then never troubled with the complaint which is now our bane. How can this be accounted for except by the deterioration of the plant itself?" The causes which produce failure now, and which did not exist formerly, may, I think, be referred—1st, to change of climate; 2nd, change of soil; 3rd, change of practice.—1st. Change of climate. The great increase of draining, enclosing, and planting for shelter, has produced a very sensible change of climate in exposed situations, which are the places most in vogue for the supply of seed potatoes. In the case of Sawdon, mentioned above, enclosure, &c. was at any rate contemporaneous with the deterioration of their seed potatoes, and the marshland districts, which were formerly supplied from Sawdon, now get their seed from Scotland. It is indisputable that both cold and wet retard the maturity of all plants: the improved practice of the present day has removed the one and very much reduced the other, and accordingly our potatoes become more thoroughly ripened and make worse sets. To those who are inclined to attach little importance to this reasoning, I would put the question—where would you go for seed potatoes if you should be troubled with curl? I answer without fear of contradiction, that if you are at all conversant with the subject, and have no fresh land that you can conveniently break up, you will either send to an exposed hilly district, or to a peaty moorish soil. Here, then, we see that experience guides us to the cold, wet soils, to those places, in short, which are highly unfavourable to early maturity, and from which we have a good chance of obtaining unripe seed.—2nd. Change of soil. In spite of the numerous valuable suggestions which the farmer has already received from the man of science, agricultural chemistry is still too much in its infancy to be able to specify the exact proportions and combinations of the various elements of vegetable life which should exist in a soil to enable it to bring to the greatest perfection the crop with which it is to be sown; and accordingly we find that no chemical combination of manures that has yet been tried has produced a compound in which plants grow with so much health and vigour as they do in fresh (*i. e.* uncropped) soil of good quality. This fact is admitted on all hands; but let us examine it a little more in detail. To say that uncropped soil will grow

most (if not all) plants in greater perfection than land that has been in tillage, is tantamount to saying that in our ordinary routine of cropping some element or elements are removed from the soil which we do not restore to it in the manures which we apply. Hence it follows that the longer we continue such a repetition of crops and manures, the greater will be the deficiency of the substances which we fail to supply, until at length some one crop, more dependent than others on those particular elements, fails to grow with its accustomed vigour, and is attacked by diseases and parasites previously unknown. If all land were of similar quality, and had been treated alike in every respect, this falling off of certain crops would have been simultaneously remarked on its first occurrence; but with the infinite variety of soils, mode of cropping, and manuring which prevail on different farms, and even on different fields of the same farm, the question is so complicated as to remain still doubtful. The remedy for this unavoidable (because as yet indefinable) deterioration of soil, is to resort occasionally to fresh land for seed, and to make use of every available variety of manure, until the advance of science shall enable chemists to point out the deficiency and suggest the remedy in each individual instance.—3rd. Change of practice. Another cause to which some little weight is due is the decidedly improved practice observable amongst the farmers of the present day. They have better teams, superior implements of husbandry, and, stimulated by the more enterprising of their class, are less in the habit of dawdling over their seed-time, and thinking it of little importance whether they sow or plant a month earlier or later. It is rare now to see a man planting potatoes in the middle or latter end of June, though even yet I occasionally see an instance of it, and am told that a generation back it was by no means uncommon. Potatoes planted thus in the middle of summer on undrained, perhaps unenclosed, land, would, in ordinary seasons, be taken up unripe; on the occurrence therefore of failure in the crop of a good stirring farmer, it would be easy for him to get seed from a neighbour whose potatoes grew well because they were late planted and badly ripened, and thus for a time the curl would be stopped.

The foregoing remarks will make it sufficiently plain that the principal remedy I propose for the potato failure is the use of unripe sets. As, however, there are two ways of procuring unripe sets—one by planting late, the other by taking them up early—it may be well to point out some reasons for preferring the former plan. Potatoes that are taken up early have so great a tendency to vegetate during winter, that it is scarcely possible to prevent their being weakened by premature growth before the time of planting arrives. By planting late we not only avoid this

evil, but have the additional advantage that after the turnips are sown a hand or two may easily be spared in the month of June to dig or fork out the sides of hedges, corners of fields, young plantations, &c., which are frequently mere nurseries for weeds, and by planting a few bushels of potatoes in these out of the way places, a supply of seed of superior quality will be procured without interfering with the regular crops. They should be taken up whilst the tops are still green. It is easy to see when a potato plant has done growing, and then without any loss of time, and before a single yellow leaf appears, the plants should be lifted. If it should be practicable to expose them to the sun for a few days before they are put by for the winter, they will keep better and grow more vigorously. I am quite at a loss to explain this fact, but I have been told by several gardeners that they have followed the practice for years with uniform success, and it has occurred to myself more than once to observe a particularly luxuriant chance plant, and on taking it up to find that it had sprung from a green potato which had been thrown aside when the crop was harvested. In conclusion, I would beg to remark that, should my supposition as to the causes which make ripe potatoes bad sets prove wholly incorrect, there is, at any rate, no doubt as to the correctness of the facts; and whilst the researches of philosophers are slowly but surely demolishing all erroneous theories and confirming true ones, we farmers may possibly turn to account the practical suggestions deduced from several years' careful observation.

After writing the foregoing paper, a friend called my attention to a very able article on the potato failure by Mr. Stephens, in his excellent work 'The Book of the Farm,' pp. 671-674, and to Professor Johnston's 'Lectures,' pp. 763, 764. The latter gentleman alludes but slightly to the subject, but speaks of it as "highly deserving of further investigation." Both the passages pointed out, however, make it clear that the notion of the curl or potato failure being caused by overripening of the set, is by no means new; and my first impression after reading them was to suppress my paper altogether. A moment's consideration, however, showed me that Mr. Stephens does not acknowledge himself a convert to the theory, though he allows it some weight, and Professor Johnston treats it as an open question. Under these circumstances I thought it best to leave my paper untouched, thinking that, as the experiments and chemical reasonings are certainly new, they might be considered interesting, and, at all events, I shall be glad to contribute my mite in support of a theory which I undoubtedly consider to be the true one.

Kirby Hall, York, March, 1845.

XIV.—*Comparison of Guano with other Manures.*—By DAVID BARCLAY, M.P.

To W. Miles, Esq., M.P.

MY DEAR SIR,—The very extensive use of guano as a manure, and the prospect of very large supplies from Peru and the West Coast of Africa, induced you to recommend to the Council of our Society, that some of its members should undertake to test the relative value of the different kinds, including Potter's artificial guano, as compared with farm-yard manure; and Humphrey's compound was subsequently proposed to be tried at the same time. I undertook, for one, to make these experiments. We were instructed to sow Skirving's Swede, and to apply 20 tons of farm-yard dung to the acre, 3 cwt. of guano, and such quantities of Potter's guano and Humphrey's compound as the proprietors might desire.

The land which I selected for making these experiments is a light flinty loam of uniform quality, with a chalk subsoil. Long strips of an acre each were measured with exactness, and admitted of 16 rows of plants in each strip, at the distance of 26 inches between the ridges. Four acres were drilled on the 22nd of June; the fifth acre, with Humphrey's compound, was delayed for want of seed till the 26th. Instead, however, of 20 tons of dung as proposed, only 12 tons were applied; of the African and Peruvian guano, and of Humphrey's compound, 3 cwt. each; and of Potter's artificial guano 4 cwt. by his desire: all were mixed with 9 cwt. of ashes, and drilled in with the seed on the Scotch system. The 5 acres were twice hoed. About the middle of January, 1845, 2 entire rows out of the 16 in each strip were raised, trimmed, and weighed, and the weights, multiplied by 8, must have given the weight per acre with accuracy, as, owing to the great length of the rows, no material departure from exact results could take place. The following table will show the cost of each manure, the produce per acre, the value estimated at 15s. per ton, also the cost of each manure, and its application per ton of roots.

The long drought which we experienced will account for the small produce per acre, and may possibly have exercised a greater influence on one description of manure than on another; I cannot, therefore, consider my experiments so decisive of the relative value of the manures as if the season had been more propitious: but should the trials undertaken by others correspond in their results with mine, information will be elicited which may be useful to the agricultural body. It was remarked that the drought appeared to have the most influence on the acre manured with dung, turning the leaves more yellow than on the other strips dressed

with guano; and until the weights convinced us of our mistake, we were under a strong impression that the guanos had beaten the dung. There remains for us to learn the value of these manures upon the succeeding crop of barley, for which purpose the 5 acres will be carefully distinguished, and the produce of each accurately measured.

I remain, Sir, yours, &c. &c.,

DAVID BARCLAY.

Eastwick, February 12, 1845.

ACCOUNT of EXPERIMENTS as to the relative Value of Farm-yard Manure, African Guano, Peruvian Guano, Potter's Guano, and Humphrey's Farmers' Compound, conducted on Eastwick Farm, in the County of Surrey.

No.	Description of Manure.	Quantity used per Imperial Acre.	Cost of Manure, Carriage, and Application.	Produce of trimmed Swedes per Acre.	Value of Produce at 15s. per Ton.	Cost of Manure and Application per Ton of Swedes.
1	Farm-yard	12 Tons	At 5s. . £3 0 0 Carriage, 1 4 0 Spreading, 0 4 0 <hr/> 4 8 0	T. cwt. qr. lb. 9 7 3 20	£ s. d. 7 1 0	s. d. 9 4
2	African Guano	3 cwt.	At 6l. 10s. per ton, 0 19 6 Sowing, 0 2 0 <hr/> 1 1 6	8 2 0 0	6 1 6	2 8½
3	Peruvian Guano	3 cwt.	At 10l. 10s. 1 11 6 Sowing, 0 2 0 <hr/> 1 13 6	8 0 0 0	6 0 0	4 2½
4	Potter's Guano	4 cwt.	At 12l., 2 8 0 Sowing, 0 2 0 <hr/> 2 10 0	8 17 2 8	6 13 2	5 7½
5	Humphrey's Farmers' Compound.	3 cwt.	At 12l., 1 16 0 Sowing, 0 2 0 <hr/> 1 18 0	5 17 3 0	4 8 3½	6 6

XV.—On the *St. John's-day Rye*. By PH. PUSEY, M.P.

THE late Lord Leicester advised that no farming experiment should be published until it had been successfully tried for three years. But though I have not grown the *St. John's-day rye* as yet even for two complete years, its promising appearance, and the approval of neighbouring farmers, encourage me to lay a short account of this plant before the Society. It was in 1842 that Mr. Taunton of Ashley, near Stockbridge, first made it known to me in the following terms:—

“ In your digest of the progress of agricultural knowledge you say, of early rye, that ‘some farmers do not approve of it; for while young it gives but little food, and it shoots up rapidly to a harsh stalk, which stock do not relish.’ But this reproach does not apply to the variety of rye which is the best worth cultivating; and, as I think, the only one worth cultivating to any extent for the purpose of green meat—namely, the *St. John's-day rye* (*seigle de St. Jean*). This plant, if sown in proper time, and on a suitable soil, presents itself to the scythe in a state palatable to horses for full three weeks, or more. I would sow not more than one-fourth of the ground with common rye by the side of it, for the common rye is a very few days earlier, and by the time when that becomes harsh and woody the *St. John's-day rye* has attained its perfection. Of this latter I have had, on a suitable soil, to the extent of 11 London loads of straw per acre when left for seed; for it will grow from 6 to 7 feet high. The time to sow it is the 24th of June; at all events get it in before July. The soil for rye ought to be a siliceous soil; it does not reject a considerable admixture of clay, but it ought to come under the description of a sandy loam. If you want such a burthen as I have described, of course the condition of the soil must not be poor, and such produce will pay for good land. The soil, too, needs to be compressed after sowing, if the land be at all light, by rolling or sheep-treading; otherwise the rye-plant is peculiarly obnoxious to the wire-worm. The mass of foliage in October would induce you to feed it then; but I would recommend you to abstain: the leaf (unlike winter barley) is very little changed by the winter, and it so cherishes the young foliage, which shoots up in spring covered with this dense mantle, that it will repay your forbearance with ample interest. I have seen it in the end of February, or beginning of March, equal, if not superior, to the best water-meadow for ewes and lambs; for soiling in stable, the horses will eat it when the ear is fairly developed, and it may perhaps be 5 feet high (according to the soil); it will have tillered so much that the produce will be a very heavy one.”

In June of the following year (1843) Mr. Taunton sent me another account of his further success in the growth of the *St. John's-day rye*:—

“ I inclose to you a stalk of my *St. John's-day rye*, length 6 feet: it has not yet flowered. I began to soil eight cart-horses with it on the 13th of May, then 3 feet high, and four cows a week later. Both these

kinds of stock still eat nearly the whole of it, with scarce any waste, so that it has now been twenty-two days in use, and I expect that they will eat it freely some days longer: thus, you see, extending its eatable state nearly to a month. If I had possessed a greater breadth of this crop in the present season, I should have begun a week earlier, not waiting till it had attained the height of 3 feet.

"The ground which bore this had a dressing of dung just before sowing. It succeeded wheat, cut green into stable; but your calcareous grit detritus is a far more favourable soil for rye than our chalk.

"This plant, and, I believe, this variety, proved fatal to hundreds of our brave men on the sandy plains of Belgium, two days before the battle of Waterloo. They marched through fields of it higher than their heads. The glittering points of their bayonets marked the track of their march to the enemy's artillery, which was on an eminence, while the rye being higher than their heads they could see no enemy, and knew not whither to direct their fire."

Mr. Taunton having presented me with some seed of this rye, it was sown in the course of July, 1843, on some poor moory soil without manure, was fed off in the autumn, and again in the spring, yet produced on little more than a quarter of an acre, 13 bushels of seed. That seed was sown again last year in August as soon as harvested: it produced on a sandy loam very good feed in the autumn, and in this backward spring it realised Mr. Taunton's description, and established its character here by covering 4 or 5 acres with a thick coat of herbage, in which the lambs were browsing breast high, while there was little or no other feed in the neighbourhood. I find, too, in the late Mr. Rham's Dictionary of the Farm, a yet more favourable account of it. Under the article Rye in that convenient little book, our lamented colleague observes: "There is a variety of rye mentioned by continental authors by the name of St. John's-day rye, because it grows so rapidly that if sown about St. John's day it will be fit to mow green by the middle of September; and in favourable seasons may be fed off again in November without preventing its giving ample feed in spring, and a good crop of grain at the next harvest. It might be advantageous to introduce this variety into England if it be not already known." On the other hand, it is right to state that, when our seedsman Mr. Gibbs inquired respecting it in its native country, he was informed that its cultivation was not spreading in Belgium. But the reason assigned was its inferiority to the common rye in yield of seed; and this objection, though valid in countries where ryebread is eaten, will not apply where, as in England, rye is intended principally for green fodder. Although then, as I said, my trial of the St. John's-day rye is incomplete, and though it has not been sown here as yet on its peculiar day, it has evidently two advantages over the common rye. It tillers so much as to

produce double the quantity of herbage on the same space of ground. Indeed in one field where the two varieties were growing together, the common rye, after twice feeding off, became so thin that I ploughed it up; while this new rye covers the ground with its third crop as with its first. Besides tillering more, it is also sweeter than the common rye when young. Where they grow together, the hares and rabbits, while we had any, ate it before the other. Its principal merit, however, is its superior sweetness in advanced growth, and the consequently longer time during which it remains fit for use as spring feed. Good farmers who have seen it agree with me, that this new rye should be tried upon such light hollow soils as we sometimes find on our southern chalk-hills. On such land, in dry seasons, farmers often lose their turnip crop after it is singled out; but rye is known to bear well such looseness of soil. If it were sown instead of turnips, or where the turnips had missed, on a part of the turnip-land, even one green crop in the autumn, to say nothing of two, and another in spring, might compensate for such a crop of roots as this land generally yields. If it stood for seed afterwards, it would then also take the place of the barley crop, the turnip's natural successor; and the rotation would remain undisturbed. I will only add one suggestion, or rather call attention to a statement of Mr. Taunton's, that if the *St. John's-day rye* be left uneaten in the autumn, it will afford feed for ewes and lambs equal to the best water-meadow, as early as the beginning of March or the end of February, an invaluable time for such feed. All that is hoped of a new plant is seldom realised in practice; but what I have myself seen of the *St. John's-day rye*, and the opinions of farmers who have also watched it, make me sure that I should not be rash in advising occupiers of light lands to give it a trial, but that unfortunately, as I am informed, no seed is now to be procured abroad with a certainty of its genuineness.

Pusey, May 12, 1845.

XVI.—*On a variety of Rye as Green Fodder.* By ROBERT BAKER.

To Ph. Pusey, Esq., M.P.

SIR,—I read with much attention the communication made by you to the Committee of the Royal Agricultural Society "upon the growth of *St. John's-day rye*," and as I have cultivated rye for feeding purposes for several years with great advantage, I have much pleasure in communicating the results.

The difference in the varieties of rye I discovered accidentally some years since. Having obtained seed from two different seedsmen, I found in the following spring that for the purposes of early feed the produce from the one was a *fortnight* earlier, and *twice* as much in produce superior to the other. Since that time I have invariably grown my own seed, and rarely fail in obtaining a plant, whereas previously I hardly ever obtained one, from the circumstance of old rye being mixed with new by persons interested; and the *old* very rarely vegetating, my plants were thin, or failed altogether.

I have, from long experience and observation, brought my system of cultivation to such a degree of perfection that I never fail succeeding in obtaining a plant; and by the application of the produce I am enabled to support all my horses and neat stock for two or three weeks before my neighbours commence. From the middle of April last I have thus been enabled to maintain upwards of forty horses and colts, and fifty head of neat stock: the former up to the present time, and the latter until the 14th of this month, almost without the assistance of hay. The chief difficulty I had to contend with was to remedy the great waste occasioned by the horses and stock in foddering; for as the rye advanced in stem, the stock would eat only the most tender portion, and if tares were sown in conjunction, would waste the greater part of the rye in the endeavour to extract them whilst feeding. To remedy this, I now cut the whole into chaff; and by the addition of a small quantity of hay, and about one-half sweet wheat or oat-straw (which I gradually diminish as the season advances), I succeed in obtaining a description of food of which, for early use, I know of nothing as an equivalent, whether in point of cheapness or utility, besides the advantage of gradually adapting the change from dry to green food without risk or inconvenience to the animal. The number of acres consumed to the present time, of rye alone, and in conjunction with tares, does not exceed 9 acres, and the land upon which it is grown is already in a forward state for turnips. I will now give a condensed statement of the process, and advert to those points necessary to be attended to in the cultivation as I proceed.

To succeed to perfection, a fine tilth must be obtained, and the land should be of a sandy or gravelly quality. The rye should be sown when the weather is *perfectly dry*, and the land harrowed previously, so that it may be covered as lightly as possible. If sown upon a whole furrow, or during wet weather, or if put in deep, it rarely succeeds. These are the three points that require particular attention in its cultivation. My plan is to plough a clean wheat eddish immediately after the wheat-crop is removed; and with two or three scarifyings or additional ploughings, reduce

the soil to the finest possible degree of pulverization. After the last ploughing I harrow the land before depositing the seed; and about the middle of September or early in October, I sow 3 bushels of seed per acre, which is harrowed in lightly, and the land left without rolling, unless with a very light roller between the harrowings. If the rye is very forward (which, from having a mild autumn, is sometimes the case), it will, in the event of a heavy fall of snow succeeding, be sometimes greatly injured for spring use; but it must on no account be fed off with sheep, as it never comes well to the scythe afterwards. A portion should be manured for the first cutting, to enable its being used a week or ten days earlier. When ready for use, which in ordinary seasons takes place at the commencement of the month of April, it is carefully mown, and cut by a chaff-cutting machine, with the addition of a moiety of straw and hay, the proportion of the former being as four to one of the latter; and the cutting should so proceed that it may be adapted to the consumption of each day, using it as soon after being cut as possible. The chaff-boxes used by me are of the common sort, having an adjustment, invented by Dyball of North Walsham, for feeding without assistance of the person using them. The cost of cutting is from 14*d.* to 15*d.* per 60 bushels, and a man cuts from 100 to 120 bushels per diem. The horses are fed in the stable with oats, in addition, and in the yards at night with cut chaff only. The cows and neat stock are fed with the addition of oil-cake, broken fine, or not, as may be requisite, and no portion whatever is allowed to be wasted; for by supplying it from time to time as required, every particle will be eaten. As the rye advances into ear, less straw and hay are then used; and of every 100 bushels added at the present time, 56 lbs. of hay and 72 lbs. of wheat-straw are the proportion, some tares being grown in conjunction with the rye.

I know of no other food for *early spring use*, as a substitute for hay, equal to this, nor of any other system whereby so large an amount of excellent food can be procured from a small quantity of land; and in point of economy, those who have not adopted the system have not the slightest conception. During this spring in particular I have found it of most decided advantage; and at the high price of hay at the present moment I estimate that every acre of rye, thus produced, has been worth at least 8*l.*; and when it is considered that it is obtained with scarcely any injury to the land whatever (turnips succeeding as well after it as can be desired), I am induced to make this communication, in the hope that through your endeavours to promote the interests of the British agriculturist it may become known and more generally adopted in other districts.

I shall be very glad to forward you a small quantity of my seed

when ripe, that you may be able to compare it with the St. John's-day rye you have referred to.

I have the honour to remain, Sir,

Your obedient servant,

ROBERT BAKER.

Writtle, Essex, May 24, 1845.

P.S.—I have since weighed a square perch, and find the weight to be 12 stones, or 168 lbs.; and on parts of the field it would have weighed at least 200 lbs. Upon an experiment made, we found the horses refused altogether to eat it if uncut; and I am so convinced of the economy of this mode of feeding, that I am still cutting that of which the larger portion is tares, and shall continue to do so until Midsummer.

Note.—It appears to me that Mr. Baker's variety of rye, though equally or even more valuable, cannot be the same with the St. John's-day rye, because it is earlier than the common rye, whereas Mr. Taunton states that the St. John's-day rye, so far from being earlier, is a few days later.
—*PH. PUSEY.*

XVII.—*An Account of Improvement of a Shaking Bog at Meare in Somersetshire.* By ERASMUS GALTON.

I SEND the following account of a very successful reclaiming of wet peat bog land, in order to show that it is possible to *top-dress peat bogs* (after draining them) with clay or other soil; and that the clay *will not sink and be lost after a few years*, as I have almost invariably found farmers in this county state to be the case when recommended to reclaim their peat lands. Now as I feel confident that it will not be found so in practice (if the land is first drained), I send you the following account of reclaiming wet bog land in the large tract of flat country between Bridgewater and Glastonbury, in the county of Somerset, which was commenced in the year 1811, and has constantly been going on up to this time.

The bog is of so soft a nature that a person trotting his horse on the turnpike road abreast of the land treated of, will see the water in the ditches quite ruffled by the concussion of the horse's feet on the road.

The plans, sections, and table of expenses, are taken from the papers of the intelligent agent (Mr. Richard Hammet, of Street, Somerset), who was the proposer and entire manager of the improvements, and through whose well-directed perseverance they have been perfected, in spite of the ridicule and opposition that he encountered from the resident population, who considered him engaged in a mad project, involving the waste of his employer's capital.

If there is anything in this statement that makes it worth while to make further inquiries, I shall have much pleasure in doing so; for, as a practical farmer and a near relation of the proprietor, I have taken much interest in the improvements during the last few years.

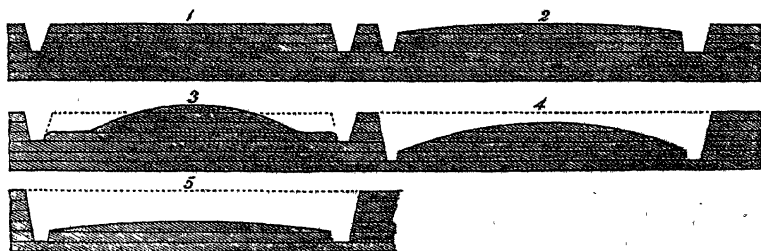
West Hay Moor is an extensive tract of bog land, situate in the parish of Meare, in the county of Somerset, allotted and awarded about fifty-five years since to sundry tenements, under the authority of an act of parliament. A large proportion of this bog has remained up to this time uncultivated, and of little or no value except for peat fuel, which is dug in large quantities.

In the year 1811 it was determined by an owner of 300 acres of this land, the late Samuel Galton, Esq., of Duddeston, near Birmingham, to bring it into use by draining and top-dressing with earth, consisting of the deposit left on the banks of the river Brue after heavy rains, which is a very rich soil.

To set about this, it was necessary, after draining the land, to dig a canal about sixteen feet wide, and build boats, to boat the soil from the river Brue to the spot (the nearest distance about a mile); and, as the Brue is at a lower level, it was necessary also to build a lock at a point of the canal to raise the boats. This has all been done; and belts of plantation made to protect the land from the west wind, the moor being open to the sea breeze, as it is below the level of the sea at high-water mark at spring tides, although several miles inland.

A plan is sent at the end to refer to, and sections to show the effect of the drains on the level of the land. And the following table gives an account of the way in which the land has been drained—how the peat bog has become compressed as soon as the water drained itself off.

The land, after being formed into convenient sized fields, was then made into bends or ridges of about 13 yards wide (see sections 1, 2, 3, 4, 5). The expense appears very small, considering the work done; but it must be remembered that the peat cuts very easy—that the work is done in the winter, when labour is cheap—and that in this parish low wages are given to the poor labourer at that time of the year.



No. of Section referred to.	A Description of each Process.—See Sections.	The whole Expense per Acre of each process.
1.	Is a cross section of a bend (as it is here called) 40 feet wide, with a 3-feet open drain on each side, cost	£. s. d. 0 10 6
2.	Is a cross section of a bend, after one-third on each side has been turned towards the middle or centre, cost	1 4 0
3.	Is a cross section, after a lodgement or run 4 feet wide and 1 foot deep has been taken from each side, cost	0 12 0
4.	Is a cross section, after the trenches have been deepened 2½ feet, and the sides again taken off to bring it to a round, cost	1 3 0
	After these several operations the bends require to be smoothed and fined over, to prepare for carrying the top-dressing, cost	0 7 0
	The trenches require to be deepened annually for at least three years, when the land becomes solid, the expense at 2s. per annum, cost	0 6 0
	Total	£4 2 6

This table shows the outlay per acre to bring the land into a fit state for top-dressing; and by referring to the sections 1, 2, 3, 4, from the first column, the process by which the land was drained will be easily understood.

The whole expense per acre in preparing the land for top-dressing is therefore 4*l.* 2*s.* 6*d.*

From this time the land is not attended with more expense than old improved land, except what is expended in top-dressing. The land in four or five years presents the appearance of the cross section (No. 5), being nearly flat, and compressed 3 or 4 feet (in some cases 5 feet); and is sufficiently dry and firm to bear cattle and horses and carts at any season of the year. Some old people complain that it is drained too much, but it is not found so in practice.

As soon as each inclosure was drained, the ling and other bog plants disappeared, and were succeeded by a thick natural crop of fern. No particular means were taken to get rid of the fern; but as soon as a top-dressing of earth was put on the land, the fern began to dwindle away, and after a time disappeared altogether, and was immediately succeeded by the clovers, and indeed

almost every description of meadow grass. Nature produces everything;—no seed is ever sown—and the soil used as top-dressing, even when dug 6 feet or more deep, produces all these fine grasses.

The soil used is an accumulation of sediment brought down by the river Brue, overlaying the peat to the depth of 6 feet, and is a compound of almost every description of soil: it decomposes the peat in a very short time. It has the appearance of clay or marl of a rich quality.

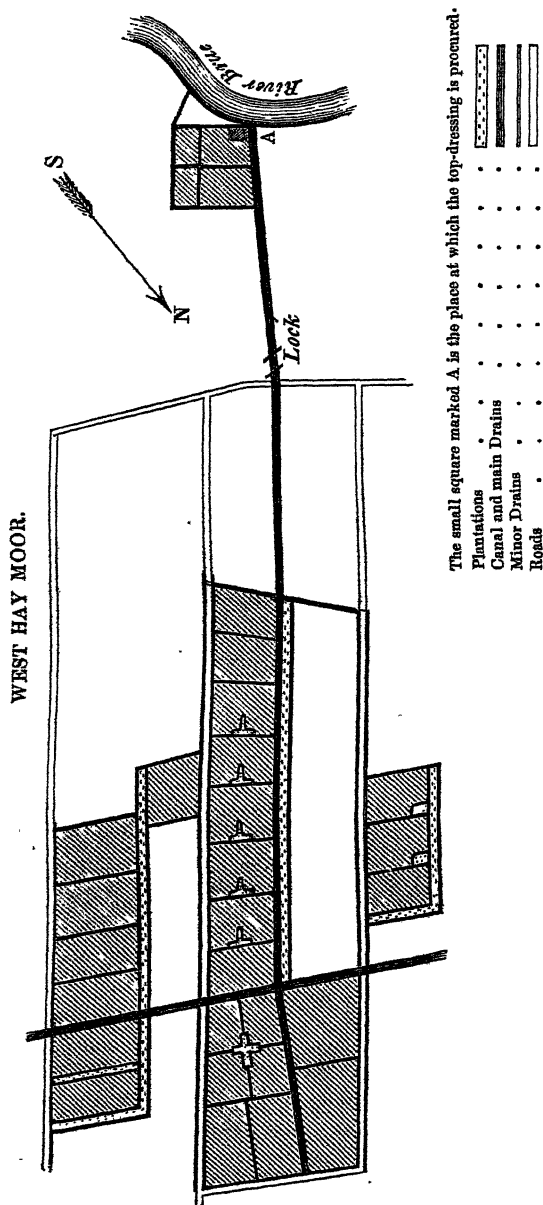
Some of this land, of which fifty years back *seven acres were bought for ten pounds*, now lets for 30s. per acre, some for 40s., as pasture, and is constantly improving. The rents have so far increased every two years. The rent for the whole is now very near *four hundred pounds*.

It has been found, contrary to the opinion of every one who was consulted at the beginning of these improvements, that the top-dressing *does not sink and get lost*; which is, I think, easily accounted for by the land being thoroughly drained.

The writer believes that the greater part of this land was bought at about 5*l.* per acre; now, however, that the plan of reclaiming has been seen, it cannot be bought but at high prices.

Whole amount of money expended on the Meare Turbary, and the number of yards of soil boated from the commencement of the improvements.

Date.	Expense.	Yards of Soil.	Date.	Expense.	Yards of Soil.
	£. s. d.			£. s. d.	
1811	76 13 11		Brought forward }	1439 3 8	2026
1812	25 18 11		1827	94 17 10	323
1813	32 8 0		1828	137 12 0	1195
1814	45 14 4		1829	250 8 5	1120
1815 }	134 11 10		1830	204 0 11	1695
1816 }			1831	247 3 9	1461
1817	19 6 4		1832	211 17 7	2252
1818	52 15 1		1833	224 0 1	2029
1819	51 7 5		1834	252 5 7	1210
1820	56 12 7		1835	281 17 8	2352
1821	60 10 5		1836 }	448 17 0	2031
1822	62 8 1	90	1837 }	252 6 10	1680
1823	99 12 1	99	1838	122 16 0	2270
1824	130 7 10	651	1839	185 2 7	1549
1825	126 6 9	632	1841	205 8 7	1428
Canal	253 8 10		1842	211 13 7	2919
1826	211 1 3	554			
Carried forward }	1439 3 8	2026	Total	4770 1 10	27,540



27,540 yards of this soil weigh 33,000 tons; quantity of land earthed over is 331 acres, at about 100 tons per acre. Expense per acre about 14*l.* 10*s.*

The labour is all done by task-work, the boatmen getting 7*d.* per cubic yard for the soil dug out of the ground, boating and landing.

Whoever undertakes to improve peat bogs should pay particular attention to draining, as otherwise top-dressing and the expense of labour are money thrown away.

	£.	s.	d.
27,540 yards of soil, at 7 <i>d.</i> a yard . . .	803	6	0
Draining 331 acres, at 4 <i>l.</i> 2 <i>s.</i> 6 <i>d.</i> . . .	1365	7	6
Deduct	2168	12	6
From whole money expended	4770	1	10
There remains	£2601	9	4

For planting, canal-boats, carting the soil from canal side, and other expenses.

The writer has not allowed for the interest of the money.

Loxton Manor House, near Cross, Somersetshire.

XVIII.—On the Advantage of very Shallow Cultivation upon a light Moory Farm in Gloucestershire. By HENRY PARKER.

HAVING had considerable experience in the cultivation of moory land, and having for several years turned my attention to the best method of procuring early spring feed, I proceed to state my mode of management upon a farm of 200 acres of arable land of light, poor, thin moory soil, with a subsoil of either blue or white clay, peat, or white gravel.

Rotation of Crops.

First year,	Early turnips	No. 1
Second „	Wheat	„ 2
Third „	Vetches and turnips, or Swedes	„ 3
Fourth „	Barley	„ 4
Fifth „	Meadow grass, <i>Lolium perenne</i> , var.	„ 5
Sixth „	Meadow grass, second year	„ 6

First Year, Cultivation for Turnips.

No. 1. This portion being always the second year's seeds of No. 6, I breast-plough and burn, throw the ashes equally over the

land; breast-plough again rather deeper than before, harrow and drill with the turnip seed (sufficiently wide to admit of the horse-hoe) sixty bushels of artificial manure, consisting of lime, wood, and turf ashes, in equal quantities, leaving it lightly rolled; and when the plant is high enough I commence using the horse and hand hoes, which I continue to do very frequently throughout the summer, thereby encouraging the growth of the turnips, and enabling me to begin feeding them off in the month of August.

Second Year, Cultivation for Wheat.

No. 2. The Turnips of No. 1 being consumed, I breast-plough to mix the sheep manure with the soil, horse-plough very lightly, drill $2\frac{1}{4}$ bushels of red lammas wheat per acre, leave it till the spring following, and before the horse-roll can be used send women to tread it, and, if occasion require, tread it again; after which I have it twice hoed. I have found more benefit from this mode of pressing than any other, being done at a time when wheat, on this description of soil, requires assistance.

Third Year, Cultivation for Turnips.

No. 3. The stubble of the wheat-crop of No. 2 being cleared, I breast-plough, plant 2 bushels of winter vetches per acre, hoe them the spring following; when fit, feed them with sheep. Breast-plough, rake up, and burn everything that would be in the way of the drill or horse-hoe; drill in, with the turnip seed, 10 bushels of bones per acre, lightly roll it, and adopt the same management with regard to hoeing as described in the cultivation of No. 1. After the turnips of this field (No. 3) have been eaten, I again use the breast-plough, and leave it till the time of planting barley, when I—

Fourth Year, Cultivation for Barley.

No. 4. Breast-plough, harrow, drill 4 bushels of barley, and sow 2 bushels of meadow-grass seed, *Lolium perenne*, var., and 4 pounds of red or broad clover per acre; harrow and roll. The meadow-grass being intended for early, and the clover for late food.

Fifth Year, Meadow Grass.

No. 5. The turnip crop of No. 3 being now nearly consumed, and the couples requiring a change of food, I am enabled, by about the 6th of April, to place them on my early spring food, which being eaten I leave for seed; and when the lattermath is fit, again hurdle it off with the ewes during the day, removing them every night to the turnips of No. 1, which are now being stocked to plant with wheat.

Sixth Year, Meadow Grass.

No. 6. This being a two-years' ley, I feed it the whole year; the early part of the season allowing the sheep to remain in the same field; but the latter part, removing them every night as described in No. 5.

Management of the Flock.

I will begin with the month of August, when I have commenced feeding the turnip crop of No. 1. The flock would now consist of 150 stock ewes, 75 ewe and 75 wether lambs; the stock ewes going during the day to the lattermath of Nos. 5 or 6, returning at night to No. 1, to leave extra manure and firm the land for the succeeding wheat crop; the lambs remaining wholly in No. 1, eating corn, and having their turnips cut till consumed, when the wheat is planted and the flock removed to the turnips or Swedes of No. 3, where they remain till about the 6th of April. The turnip crop being now nearly consumed, the wether tegs are sold to the butcher, the ewe tegs left to finish the few remaining turnips of No. 3, and the ewes and lambs removed from the pen used for yeanning to the early spring feed of No. 5, now fit to receive them, which, from not having been stocked the preceding year after harvest, but allowed to grow, has been protected from the frost, and is rendered more wholesome by the young and old grass being eaten together, so that the sheep do not scour. Food of this description at this early period of the season, upon a poor, thin, moory farm, without an acre of meadow land, I find of most essential service, particularly for my ewes and lambs, having always observed that, although taken from turnips or Swedes, sainfoin hay and a well-littered comfortable pen to lodge in at night, they have made a decided improvement when placed on this food. I would here remark, that on this day, the 24th of February, while moory land generally is wearing a russet withered appearance, this grass of No. 5 looks green and flourishing, and appears in no way to have suffered from the inclemency of the weather. I have never been able to obtain keep of any other description so early that will not scour, possessing so much nourishment, or capable of yielding the quantity of milk, on this description of land. I do not allow my sheep to have their food without being hurdled to them every day, thereby making it go farther, and keeping the flock more in the same condition throughout the year; and that the lambs may go forward, have more liberty, and pick out the shortest and sweetest of the keep, I have "creepers" placed to enable them to do so. I have never known this grass killed by the frost, although my wheat in the adjoining field has; neither have I found it possess any evil tendency to draw the soil or deteriorate the succeeding crop. About

the 12th of May I remove the sheep from No. 5 to No. 6. I have always considered the crop of seed to be nearly as much, and the quality better, than if it had not been stocked from the manure left, and the land being firmed by the treading of the sheep. Indeed, were this field, No. 5, to produce nothing more than the early food spoken of, so valuable have I found it, that I believe it already nearly to have paid its rent; but in addition to this it affords me a crop of seed, the straw of which is consumed by the stock ewes during the winter when on turnips; and from the clover seed sown with the grass, food is obtained the same year after the seed has been carried; and again the following year is fit to be stocked after the early spring feed of No. 5 has been consumed, and upon which, No. 6, the sheep are now placed, where they remain till the vetches of No. 3 are fit to hurdle; upon which, with the assistance of the lattermath of Nos. 5 and 6, I am enabled to keep them till the early turnips of No. 1 are again fit to begin.

By this mode of management an economical system is followed up through the whole course, by being nearly all performed by manual labour, by which means a remunerating crop will be produced and the land always kept firm, which is the only difficulty to be overcome on this description of soil. The farm, when first taken by me, was wet; as much out of condition, and as light and weak as it well could be, parts of it being merely held together by the roots of grass and weeds natural to moory land, but which must be very prejudicial to the production of those crops that are to benefit the farmer.

I commenced by draining, and then pursued the foregoing system of cultivation, by which my most sanguine expectations have been realized, though I was told that the land would be too light and too poor to plant wheat after turnips. I have never found any ill effects from paring and burning, experience having taught me that it produces a manure particularly beneficial to the growth of turnips; thereby enabling me to firm the land by sheep; for were other means used to destroy the turf of the second year's seeds, No. 6, they would seriously injure and weaken the soil, and cause much difficulty in raising the turnip crop, which difficulty I appear now to have overcome, although I plant them twice during the course; and were the turf not destroyed the effects would be equally injurious.

I rent another farm of 400 acres, half of which is a weak soil upon a subsoil of gravel with veins of clay, the remaining half is stone brash.

*Fairford, Gloucestershire,
February 24, 1844.*

Note by Mr. Pusey.

This statement of a practical farmer appears to me very remarkable, as bearing upon the supposed necessity for stirring all soils deeply. So far the other way does Mr. Parker's experience point, that he actually gives his farm only one horse-ploughing, and that a shallow one, during his six years' rotation. The breast-plough, which he uses at other times, is the same implement as is figured under the name of a paring spade in another part of this number (p. 101). The workman forces it forward with his thighs, and turns over no more of the ground than a gardener who is taking off the turf of a pleasure-ground. Yet, excepting one horse-ploughing, this is all the stirring which Mr. Parker gives to his farm in six years. The breast-plough indeed is perseveringly used by him—twice in the first year, once in the second, no less than three times in the third year, and once again in the fourth. Instead of loosening the soil, Mr. Parker's efforts tend to preserve its firmness, or restore that firmness when lost; and he states that otherwise he could not secure even a turnip-crop. Strange as such doctrine may sound, Mr. Parker does not stand alone in his practice. Another farmer (Mr. Edmunds), whose family long occupied such light moory land in the same neighbourhood, tells me they also found that nothing but the breast-plough would leave the ground firm enough to grow wheat. Occupying similar land, I may add that I never plough it deeply but I repent of so doing, and am falling more and more each year, by the advice of neighbouring farmers, into the use of the breast-plough, instead of the horse-plough. This manual labour is quite as cheap; for a good workman can pare such hollow tender land at 4s., or even at 3s. an acre. It is possible that the drought of our climate in Gloucestershire and Berkshire may be one cause of the success of this practice in those counties, and that the same soil, if transferred to Westmoreland, would require deeper working. Therefore, without recommending shallow cultivation in districts where deep ploughing has been hitherto practised, I would merely warn beginners against plunging recklessly into the subsoil.

PH. PUSEY.

XIX.—*On the Advantage of Thick Sowing.*—By DAVID
BARCLAY, M.P.

THE following is the result of some experiments which I made last year, in order to ascertain the relative merits of thin and thick sowing wheat, drilling, dibbling, and by broad-cast. They were conducted with great care upon 5 acres of level land of uniform quality, being a good deep loam on a chalk subsoil, following a clover ley folded by sheep. The land was ploughed about 5 inches deep, as it was not thought desirable to bury the sheep-dressing below that depth. The seed was put into the ground about the 7th of December, 1843, and the wheat was hoed in the spring of 1844, except the acre sown by broad-cast, which was harrowed instead of being hoed. The plants in Nos. 2 and 3 (thin sowings) were by much the strongest, and looked the best throughout the season, until the approach of harvest, when it became evident that the quality of the grain and straw was inferior, more particularly on No. 2, which appeared to have suffered a little from mildew.

Samples of the different lots were submitted to an eminent miller, and the value of each determined by him; the straw was valued at the market price. (See next page.)

The results of these experiments are very remarkably in favour of thick sowing, and particularly of the old broad-cast system; and if not conclusive against the doctrine of thin sowing, so strongly and, I may add, so ably advocated in the present day, should at least induce caution on the part of farmers before they depart from the practice of their forefathers. Indeed it is difficult to believe that so great an advantage as the saving of a bushel or a bushel and a half of seed per acre can have been overlooked for so many generations. It seems more reasonable to suppose, that long practical experience has taught the farmer the more prudent course of a liberal supply of seed. It may however be contended, that had the ploughing been deeper and the seed put earlier into the ground, the result would have been different: this is not improbable, and it is possible the deficiencies in the quality and quantity of thin-sown wheat and straw might have been less observable, but the large differences which my experiment indicates could hardly, I think, have been made up. I have this year repeated the trial of thin-sowing, having drilled one acre on the 26th of October last (the land having been *deeply* ploughed) with 1 bushel of seed, the rest of the field having 2 bushels per acre. The result I shall be happy to communicate if desired.

ACCOUNT OF EXPERIMENTS ON THE RELATIVE MERITS OF THIN AND THICK SOWING, DRILLING, DIBBLING, AND BROADCAST, CONDUCTED ON
EASTWICK FARM, IN THE COUNTY OF SURREY.

No.	Quantity of Seed used per Imp. Acre.	System pursued.	Grain produced.	Weight per Bushel.	Straw produced.	Value of Grain.	Value of Straw.	Total Value of the Produce per Acre.
1	2½ bushels	Drilled 9 inches apart	Head . . 34 bushels Tail . . 3 " — 37 "	Lbs. 64½	Trusses. 70	Head at 7s. £. s. d. per bush. 11 18 0 Tail at 6s. 0 18 0 — 12 16 0	At 36s. per load, 3l. 10s.	£. s. d. Grain . . 12 16 0 Straw . . 3 10 0 — 16 6 0
2	1 bushel	Drilled 12 inches apart	Head . . 22 " Tail . . 3 " — 25 "	62½	51	Head at 6s. 6d. per bush. Tail at 5s. 6d. " — 7l. 19s. 6d.	At 30s. per load	Grain . . 7 19 6 Straw . . 2 2 6 — 10 2 0
3	1 bushel	Dibbled 12 inches apart	Head . . 28 " Tail . . 3 " — 31 "	63½	63	Head at 6s. 9d. per bush. Tail at 5s. 9d. "	At 33s. per load	Grain . . 10 6 3 Straw . . 2 17 9 — 13 4 0
4	1 bushel and 3 pecks	Dibbled 9 inches apart	Head . . 34 " Tail . . 3 " — 37 "	64	72	Head at 6s. 9d. per bush. Tail at 5s. 9d. "	At 33s. per load	Grain . . 12 6 9 Straw . . 3 6 0 — 15 12 9
5	2½ bushels	Sown broadcast.	Head . . 37 " Tail . . 3 " — 40 "	65	84	Head at 7s. per bush. Tail at 6s. "	At 36s. per load	Grain . . 13 17 0 Straw . . 4 4 0 — 18 1 0

XX.—*On Fences.* By JAMES GRIGOR.

PRIZE ESSAY.

IN a country like Britain, so celebrated for its advanced position in agriculture, it appears almost anomalous that it should have so long retained such an evil as its overgrown and cumbrous hedges. It will at any rate be admitted that no part of our rural economy is so susceptible of improvement as the fences of England, and I am persuaded that in no department are the exertions of the Society now leading on the improvements in agriculture likely to be of greater use than in their re-construction. Though chiefly connected with them, the subject of this essay by no means refers in all its important bearings to the purely rural districts of our country; for I believe that the generality of fences are as uncouth and cumbrous in thickly peopled districts as elsewhere. Let any one take a ride about the outskirts of London, the seat of so much wealth and refinement, and he will presently observe fences on the road-side half dead, half alive, patched in many places with brushwood, full of weeds and rubbish, and resting upon a foundation at least four times wider than a rightly constructed fence requires. Around provincial towns it is the same. Close to the immediate outlets, where in general the finest buildings are erected, stands many an old irregular fence full of nettles, docks, and other herbage, presenting anything but an appearance in keeping with the trimly kept grounds of a suburban villa. I can fancy nothing which would form such an improvement in the vicinities of our towns as the substitution of neat, well-kept fences for those in present use. Our roads are, in general, well kept; and if they were bounded by fences at all in character with them, the suburbs of our cities and towns would assume something of the air and neatness observable in a pleasure-ground. More of a garden-like character would be diffused, and though the appearance thus introduced would be perhaps less picturesque, it would at any rate bespeak a more refined and careful taste.

Perhaps some prejudice exists in favour of fences as at present constituted, and that there really *are* many traits of beauty observable in the varied outline they present; filled as they are with many of the sweetest flowers and shrubs that we have. But the same remark is applicable to all districts in a state of nature, and forms no reason why a thorough change should not be effected upon them. Lovers there are of the interminable wastes of purple heath, which yield nothing whatever to the community, and are enjoyed only by a few as a scene of solitary beauty once in a season. To uphold such scenes, as well as our picturesque hedge sides, seems to be the work only of poets; whilst a growing

population view such matters through pressing necessity, and desire the bread-giving plants instead. It is the duty, then, as well as the interest of all landed proprietors, and tenants of farms, to eradicate the old wide fences, and to substitute in their room such as will occupy only a fourth part, or, in some cases, a sixth part of the space; and in order if possible to carry conviction into the minds of all as to the injury our present fences entail upon us, I shall proceed to enumerate in what respects they are hurtful to the agriculturist.

CHAP. I.—*Evils of the present System of Hedge-fencing.*

I commence by stating that they are an evil; and in establishing this important point, I do not think I can be charged with unfairness if I look for the proof of this assertion chiefly in a district famed for its husbandry—a corn and cattle district; for it is with reference to arable and pasture lands that the subject of fences is at present to be treated. I take Norfolk, therefore, the county in which hedges were first regularly introduced for the purpose of enclosing ploughed fields: for the sake of the curious, I may mention that the period of this introduction may with certainty be considered as coeval with that of Flemish husbandry, and reckoned from the latter end of the seventeenth century. Judging from appearances, one might suppose that our hedges retain to this day the whole of their original character—uneven, straggling, broad, yet incomplete in some parts, chiefly formed of whitethorn, but the outline in a great measure made up with briars, brambles, acers, elm suckers, docks, and nettles. It is undeniable that such is the type of the great proportion of all the fences in England. They are so in Middlesex, Kent, Essex, Sussex, Devon, Stafford, Warwick, Cambridge, and Lincoln, for in those counties they have fallen under my own personal observation.

1. *They are injurious, because they harbour and are a protection to all sorts of weeds.*—However carefully the field within them may be kept, there are in those fences at all times a plentiful supply of the germs of thistles, nettles, docks, dandelions, &c., ready to be distributed by every wind that blows; so that it is absolutely impossible, so long as those weed-magazines are kept up, to reckon upon a time when the land in the neighbourhood shall be completely cleared of them. For example:—Within a quarter of a mile of the populous and wealthy city of Norwich, by the side of the Ipswich road, is a fence occupying a site ten feet in width. In some parts, there is a strip in front composed entirely of nettles, two feet in breadth; the body of the hedge itself occupying about six feet, and the remaining two feet bearing a miscel-

laneous assemblage of rank herbage. In the parish of Lakenham, opposite the church, also in the vicinity of Norwich, is a fence, or, more properly speaking, an embankment (though originally made and intended simply as the foundation for a fence) thirteen feet in width. Dimensions: inner side, made up with rambling spray, brambles, nettles, &c., three feet; outside, composed of rank weeds, chiefly nettles and dandelions, six feet and a half; the hedge itself, which has been lately cut down, three feet and a half. About two-thirds of the space is thus occupied with luxurious herbage which has been allowed to perfect its seeds for a series of years; and the fact is applicable to the most of the fences throughout England.

2. *Our present fences are injurious, and that to a great extent, inasmuch as they harbour and protect snails, slugs, &c.*—Whole plots of cabbages and turnips, planted alongside one of those fences, are sometimes eaten up in the course of a night; and during the early part of the season every species of green crop suffers by those animals, which shelter themselves among the stones, rubbish, and roots during the day. So soon as the sun is down, they proceed from under the covering, and, as has been stated, devour every green blade within several yards of the hedge line. The most destructive enemies to crops which those fences protect during winter, are the slugs (*Limax ater* and *Limax agrestis*), and the common garden snail (*Helix hortensis*). Out of an old fence, where stones and rubbish had been collected about the roots of the bushes, I have dug during winter, and within the space of a yard, a peckful of the last-mentioned species; a pretty good proof what an asylum those old fences are for such pests.

3. *They are injurious, inasmuch as they harbour a great many birds, and afford every encouragement to them in the building of their nests.*—No man dislikes the song of birds. Careful farmers and naturalists are alike pleased in listening to their harmony; and, so far as *singing* birds are concerned, it may be said no one meditates any interference with them. Sparrows, however, and greenfinches do unquestionably congregate in large numbers wherever there is an old fence, and the damage they do to early barley, wheat, peas, and many other crops of the farmer, is incontestable. In thin, regularly trimmed hedges, birds do not take shelter; and though flights of them may alight upon the top of the fence, their stay is invariably short.

4. *The fences throughout England are highly objectionable, simply on account of their size.*—There is a vast length and breadth of land occupied and overshadowed by them which might be bearing corn and pasturing cattle; and though it may appear somewhat startling, the truth is, that were such as are unnecessary cleared away, and new and proper ones substituted for the re-

mainder, an accession of grain-bearing land would be available, equal in extent to one of our large counties. As is proved by actual survey (see No. 6) the average width of the fences throughout Norfolk is ten feet, which is about seven feet more than is actually necessary (22). In some counties in England the average is considerably more; and in very few is it found to be less. In South Devonshire some of the hedges are more than a perch in width; whilst the percentage of land occupied by them is as much as eight or eight and a half, or one acre in every twelve. There is no doubt but that the broad ridges of soil thus formed as banks whereon the plants are placed are made at the expense of the surface soil on each side of the fence line, which consequently becomes impoverished for several years afterwards: indeed it is to be questioned whether it does not remain much longer in a thin and hungry state.

5. *Our present fences are injurious on account of their number.*—The multiplicity of fences arises no doubt from an idea that they afford considerable shelter to the crops they surround. Of the shelter thus afforded, there can be no question; but it is surprising that it should not be universally admitted that such shelter is highly injurious to all sorts of grain and green crops usually grown in this country. Whatever tends to impede the free circulation of air to dry the stems and carry off the excrementitious moisture of plants, will occasion the mildew or rust. The evils of numerous hedgerows, especially if they are high, are never more apparent than during the latter part of the summer when heavy rains are sometimes experienced with intervals of wind and sunshine, sufficient to dry the crops were they exposed on all sides, but which, from their being surrounded by high fences, are thus allowed to lie damp and wet for several days, a prey to mildew and every other kindred disease. The best sample of wheat is not found at the hedge side, but in those parts of the field where there is an unchecked circulation of air; and the greatest weight of turnips, within a given space, is also found wherever there is a free play of the elements. "It was an opinion of the late Mr. Knight," says Dr. Lindley in his *Theory of Horticulture*, "that the motion given to plants by wind is beneficial to them, by enabling their fluids to circulate more freely than they otherwise would do;" and the Doctor adds that "if the effect of motion is to increase the quantity of wood in a plant, it is evident that ventilation, which causes motion, must tend to produce a healthy action in the plants exposed to it; and such a state must also be favourable to the development of all those secretions upon which the organization of flowers, the setting of fruit, and the elaboration of colour, odour, flavour, &c., so much depend." It follows, therefore, that the beauty, firmness, weight and quantity of grain depend upon the measure of

light and air the crop is exposed to ; so that whatever interrupts these agents must of course be hurtful. It must also be borne in mind that the number of fences seriously affects the amount of labour on a farm. The most obvious evil is the frequent turnings they occasion to the ploughman, and the time expended in cultivating the land, difficult of access, in their immediate neighbourhood. As a matter of course, it follows that to every enclosure there must be an entrance, and at most of the entrances a gate, an item of expense which when taken separately appears to be but trifling, but which in the aggregate amounts to a considerable sum ; for all those gates have to be repaired and ultimately replaced. Another evil consequent upon the number of hedges is an additional number of roads leading from one field to another ; but the crowning evil, as set forth in the following section, is the site the fences themselves occupy in conjunction with the trees which they contain.

6. *The fences throughout England are injurious on account of their containing timber-trees.*—In my estimation this is the greatest of all the evils applicable to the hedge-fences of England. As is shown elsewhere (46) it is impossible to have a complete fence so long as timber-trees are allowed to rise in the hedge line ; and even admitting that a fence containing them could be kept up so as to be serviceable in certain situations, the shade and drip of their branches, and the nourishment they absorb from the land on either side, are sufficient reasons for excluding them throughout every well-regulated farm. The most common tree found in hedgerows throughout England is the oak ; next is the English elm and the ash. After these follow the sycamore, the lime, the beech, the poplar, the willow, and the alder. The oak is naturally a wide spreader, and, so long as it is in leaf, a dense-headed tree. In hedge-rows, however, it is in some districts severely pruned ; but notwithstanding this it is found upon a fair average to overshadow a space of thirty feet in diameter. From this has to be deducted a certain proportion for such spaces as it shades where no crops are, such as roads, where its hurtful effects are merely confined to the unwholesome stagnation of air it creates, and the mildewing influences which inevitably follow. The English elm is naturally a more erect grower, with a less excursive head, and bearing pruning better than any other timber-tree in Britain. The specimens throughout Middlesex, which are in many cases pruned close from the bottom to the topmost twig, prove this position. The average spread of the branches of the elm is only twenty-three feet in diameter ; but as its roots run along the surface of the soil to a great extent, and send up numerous suckers, the farmer considers it a more determined enemy to him than the oak. The ash, again, is the worst of all trees for crops in its vicinity : its presence is felt throughout a wide circle around it ; and it is maintained by

eight farmers out of ten (the writer being one of the eight) that its injury to corn crops in its neighbourhood is equal to a total extinction of as much land as the tree, when cut down, would fall upon. Now a prostrate ash would cover, I think, a space of twenty-five feet in diameter. The remaining trees may be fairly set down at twenty-two feet in diameter, nearly the same as the elm, for as they occur but seldom, their dimensions will not affect the averages in any important degree. Now, in four different arable districts of the county of Norfolk, I have measured respectively one square mile, or 640 acres, and the result is as detailed in the table below. This table, as will be seen, is founded on the acknowledged fact that a space of land equal to that shaded by a tree is as completely lost to the farmer as if it were actually occupied by a fence;* or, in the words of one of the gentlemen whose testimony I have already embodied in this essay, that "the utter extinction of the land overshadowed by trees would be gladly submitted to by every farmer, provided the trees were to be annihilated at the same time, and this without any sought-for deduction of rent."

SECTION I.—TREES.				SECTION II.—FENCES.					
Name of Parish.	Number of Hedgerow Trees per Square Mile.	Average Space over- spread by each Tree, independent of Fence, in Square Mile.	Total Space covered by Trees in Square Mile.	Length of Fence per Square Mile.	Average width of Fence in Square Mile.	Space occupied by Fence in Square Mile.	Total Space occupied by Trees and Hedges per Square Mile.	Per Centage occupied by Hedges and Hedge Trees.	
Lakenham.....	3,664	Sq. Ft. 451	A. R. P. 37 3 29	M. Fur. 28 0 0	Feet. 8½	A. R. P. 28 3 15	A. R. P. 66 3 4	10½	
Bixley, Arming- hall, & adjoining parishes..	2,048	361	16 3 35	19 2 7	11½	26 3 18	43 3 13	6½	
Dereham.....	3,084	602	42 2 19	26 4 0	12	38 2 7	81 0 26	12½	
Hethersett.....	4,004	586	53 3 18	27 2 0	8½	28 0 12	81 3 30	12½	
Divide by 4)	12,800	2,000	151 1 21	101 0 7	40½	122 1 12	273 2 33		
Average.....	3,200	500	37 3 15	25 2 1	10	30 2 13	68 1 25	10½	

* It is not the mere surface of land shaded by trees or occupied by fences which is the measure of deduction from the crop. The relative mass requiring nourishment must be taken into calculation. The carbonic acid and ammonia derived from the atmosphere, and which form the woody fibre and albumen, in fact the chief proportion of the substance of the former, would, in their absence, become so much starch and gluten in the latter. Take away your trees and hedges, and you gain every year a quantity of nutritious food equal to the annual increase of their substance. It is a remarkable provision that the industry of an increasing population which extracts iron from the interior of the earth, permanently to supersede timber, at the same time leaves those elements otherwise required for the growth of trees at liberty to form food for the support of our increasing numbers.—W. H. HYATT.

The inference to be drawn from this table is, that if these four separate districts give a fair average of the county, then in every hundred acres of land throughout Norfolk, ten acres are occupied with hedges and hedgerow trees. Again, reckoning this county to contain, independent of gentlemen's seats, 1400 square miles of arable and pasture lands, an estimate which is considerably under that of Mr. Arthur Young, who wrote in 1801, it would follow that upwards of 94,000 acres of the best of its soil are occupied with fences and hedgerow trees. Applying these figures to the forty divisions of England, which are in general more thickly intersected with fences, &c., than Norfolk, the result would be an area equal to two of the largest counties in Britain. There are those, however, who wish to uphold the characteristic feature of England—its hedgerow trees—and I may state that apart from them altogether, the land occupied by the fences throughout Norfolk is about 43,000 acres, which, after deducting one-fourth for the necessary space required for hedges, would leave 32,000 acres disposable for corn and pasture lands. This amount multiplied by forty would indicate the extent that might be saved by reconstructing the fences alone throughout England, at 1,280,000 acres of good land. Norfolk, however, is one of the largest of the counties of England; still it is also true that it ranks amongst those which are distinguished for large and open inclosures, so that an equal portion of land might be saved in a county of little more than the half in extent. But, as already hinted, the evil of trees in hedgerows is not merely confined to the space occupied by them: it extends to the great stagnation of air created, which of course is much greater than where a fence only runs between the fields. On this subject the opinion of Mr. Marshall in his 'Minutes on Agriculture in Southern Counties,' is so much in point that I beg leave to transcribe it. "The corn," he says, "of narrow close fields, and everywhere under high trees, is, by the many heavy rains, very much lodged; and in some places, grown through, by weeds: while in large open fields, or where the hedges are low, very little damage is done. But, at present, I feel their inconveniency still more sensibly. We carried the *middle* of H. 1 (wheat) the day before yesterday (August 15) in good order; but about a load under a high quick hedge was still damp, and was obliged to be left in the field yesterday; some of the sheaves were opened to give them air;—a heavy squall came on before they could be reset up, and they are now growing into mats as they lie on the ground. Had it not been for the *high hedge* it would have been all safe in the barn. I would not wish to see the fence of an arable field above four feet high. Perhaps a good ditch, with a pruned quick hedge about that height, is preferable to any other fence. The oats of A, under a high thick hedge, are mere dung; under one

which was cut down last year to about four feet high, they are very little the worse for the weather."—Vol. I., p. 332.

7. *Our present fences are injurious on account of their shade.*—The shade of fences is a point not often insisted upon, but I consider its importance entitles it to be reckoned as one of the chief evils of the present system of hedging. High screens set around a corn field must have a very hurtful tendency both in spring time and during the season of ripening. In spring the range of the sun is low, and consequently the shade of fences and trees is extended a considerable distance over the fields which they surround. Towards autumn, again, when his influences are most wanted, and at a time, too, when he declines so rapidly from his vertical course, the interruption of the sun's rays by high trees and hedges must be very injurious. The quantity of secretion in a plant is exactly in proportion to its exposure to the light and air, for if a plant be grown where there is no light, it ceases in every constitutional respect to be any longer a type of the species. Plants which are naturally poisonous are in the absence of light and air no longer hurtful; and it is equally true that a potato grown without sunshine is void of flavour, and almost void of amylaceous or nutritive matter. Of course, no hedgerow screens can shut out all, or even any great proportion of the sun's rays, but that they do so to a certain extent is abundantly proved by the meagre returns obtained from land in their immediate neighbourhood.

8. *Our fences are injurious on account of the great exhaling surface they present.*—The effect of so many hedgerows upon our climate is a consideration which should not be passed over in an essay of this description. From the large space of vegetable surface exposed to the heavens, humid exhalations arise which go in a certain measure to cause the cold and vaporous atmosphere experienced throughout England. From its having few or no hedgerows or trees intersecting its fields, France has a much less exhaling surface, and many have thought, and (I doubt not) correctly, that its drier atmosphere is partly consequent upon that fact. It is, at any rate, clear that in open countries, such as France, or in similar districts throughout England, those diseases in corn known by the names of blight, smut, rust, and mildew, are not so prevalent as in those places where a calm close atmosphere is produced by artificial shelter. I have ascertained that during spring-time the leaf of the common elm sends off vapour at the rate of three grains daily; that of a beech tree two grains; an oak two and a half grains; a hawthorn, which is a very small leaf, one grain; a sprig of Scotch pine scarcely any thing, and a sprig of holly, yew, and laurel about a third of a grain each. The hawthorn, therefore, exhales more than any other tree of a similar-sized leaf, so that it is evident, where practicable, that the holly hedge should be pre-

ferred; for compared with the other, it sends off little or no evaporation. The holly, however, is as yet a high-priced plant, and this alone deters many persons from adopting it in preference to the hawthorn. In order to avoid this inconvenience, farmers are recommended to raise the plants for themselves; and with this view they are requested to refer to the mode of rearing the holly as detailed (35).

CHAP. II.—*Varieties of Hedge Fences recommended; with reference to soils and situations best suited for them; the mode and expense of forming them; and after treatment.*

9. Many varieties of trees and shrubs have been recommended for hedge fencing, all of which are no doubt more or less suited for the purposes of inclosure; but as there are some kinds so eminently adapted beyond others to be used in the dividing of fields, it becomes necessary to distinguish which they are, and to insist upon their being adopted accordingly. Their adoption, however, must depend upon certain circumstances, viz., the character and situation of the soil; and it is on this head the writer hopes he will be allowed humbly to state that the most of planters have erred. As in all other things, Nature has observed a beautiful adaptation amongst trees and shrubs with reference to the food they imbibe, and the peculiar habitation they affect; and it really requires no great discernment to follow her correctly throughout this interesting distribution. For the sake of clearness, I shall divide the plants suitable for hedges into three classes, viz., I. *Hedges for the generality of arable and pasture districts.* II. *Hedges for exposed situations where the soil is poor.* III. *Hedges for situations where the soil is wet and boggy.* Under these heads I shall treat of everything connected with their formation and after-treatment.

SECT. I.—*Hedges for the generality of arable and pasture districts.*

10. In this section is comprehended the great proportion of all the arable and pasture lands in England, excluding such, on the one hand, as are in elevated situations, affected by a rigorous climate; and on the other, all such as are in very low situations, overcharged with moisture, or of a loose boggy description. The plants applicable either to arable or pasture lands will be pointed out in treating of the different varieties recommended, and their qualifications for either state, or both, enforced according to their merits. It may be as well to observe here that the following directions are strictly practical, based as they are upon extensive experience both in Scotland and England for the last twenty-five years. Whoever follows them is earnestly entreated by the writer

to do so completely; for what use is there, for instance, in carefully enriching a bed for the plants if they are afterwards to be abandoned to the care of some slovenly person who has no idea of good order, and who allows the weeds to rise and choke them as they may? It often happens, too, even after a fence has been brought to maturity, that it is allowed for several years together to grow out on either side irregularly until it becomes so open that when trimmed it is almost useless as a shelter. The first tree which claims our attention is

The Hawthorn—*Crataegus Oxyacantha*.

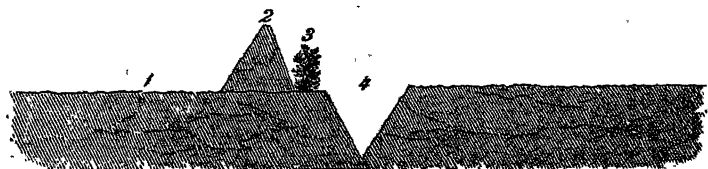
11. Of all the trees and shrubs suited to the climate of Britain, none has been found so eligible for hedge fences as the common whitethorn. It is true that in mountainous and exposed situations, where a combination of circumstances operate against vegetation, it refuses to grow with that vigour which characterizes it throughout the plains and cultivated uplands of England. Its province, however, might be easily extended beyond its present limits by using as its forerunner lines or strips of Scotch pine (*Pinus sylvestris*) planted on each side of the site intended for the hawthorn hedge, but not too near to rob the part to be sheltered of its nourishment (39). The hawthorn, when properly treated, is a very fast grower, and, under the most of circumstances, is considered very ornamental. As a fence, it is smooth, stubborn, and long-lived. It is easily reared; and in this respect, at least, it has the advantage over either the holly, crab, or sloe. As is well known, it is a deciduous tree, shedding its leaves in winter, and therefore better suited to protect crops than to shelter cattle, though in this last respect it is by no means to be rejected; for though it is not equal to the beech in warmth, it has a decided advantage over that tree, as a fence, in becoming an impenetrable barrier to all sorts of cattle. It should not be intermixed with other sorts of trees, for though growing tolerably well with the holly and beech in some soils, the treatment in an essential point, viz., trimming, which is insisted upon in its proper place, is not applicable to all.

12. *Soil and situation*.—The soil it delights in most is a hazelly loam, or, if not too retentive of water, a good clay bottom. At the same time, it will grow well on sand, if free from iron, and on almost every other description of land except chalk and pure gravel. Even on these, artificial means will enable it to grow freely. By displacing the gravel and chalk, and filling up the trench to the depth of three feet with loam, I have found that such subsoils will not hinder it from reaching to the height of five feet in six years. On wet soil it is soon covered with lichen, a sure indication that it is not in a thriving state.

13. *The preparation of the soil* is perhaps the most important process connected with hedge fencing, though it is one which is the least of all attended to. Nothing can repay the planter more satisfactorily than the previous management of the land, and I have adopted it as a rule whenever called upon to form a fence, if the proprietor should object to go to the expense of having the land trenched at least to the depth of two feet, and well manured, to decline the undertaking altogether. This trenching and manuring I hold to be necessary under all circumstances, whether the "hedge and ditch" form be adopted or the sets planted on the level surface of the ground, or on a slope. If practicable, the land should be trenched several months before the time of planting, and immediately manured, so that the manure and the soil may be completely incorporated when the trench is opened up for the reception of the plants. The trench should be at least two feet and a half in width. It is delightful to witness the vigour and rapidity of growth which a hedge will assume after the soil is prepared in this way, the plants generally maintaining an uniformity of action such as an unprepared bed never displays. It is the grossest thoughtlessness to suppose that the hawthorn, any more than wheat or turnips, will rise luxuriantly unless excited by the richness of the soil, either naturally, or by the application of artificial means. Amongst other advantages, I may mention that well-prepared soil, compared with that which has not been manured, will save all the expense of protecting the fence for about two years, an item which must be very heavy in districts where young fir poles are scarce. Hence the necessity of commencing the work in a proper and reasonable way.

14. *The construction of the bed* where the plants are placed is of essential importance, and ought to be regulated by local circumstances. If, for instance, the soil be dry, a ditch will not be required to drain the land; but if wood to protect the fence cannot be had, of course a ditch becomes necessary. If the soil, again, has too much moisture, a ditch is to be preferred even in cases where wood is plentiful. The mode in which the sites for hedges are formed at present throughout England is in many cases highly objectionable. What is called the "hedge and ditch plan" is one of the best, though in many cases imperfectly executed. It is effected by digging out a ditch parallel to the line on which it is intended to place the fence, five feet in width at top, three feet in depth, and one foot wide at bottom: the soil out of this channel is thrown upon that side where the hedge is to be planted, thus forming a sort of ridge for the plants to grow on. Now, with regard to this plan it is to be observed that it is advantageous only either in soils which have too much moisture, or wherever wood for paling to protect the hedge cannot be procured conveniently. This

should be invariably borne in mind, and I repeat it now, because it has become common to proceed with a ditch under all circumstances. If posts and rails can be had, it is very plain that there can be no propriety in forming a ditch where there is no superfluous moisture to draw off. And again, if formed only for a fence to the hedge, there can be no necessity for keeping it open for an indefinite time after the hedge has arrived at maturity. In wet soils, as already observed, such a ditch is indispensable; but wherever the soil is favourable, it is rather a hindrance to the growth of the hedge, which it must of course limit to draw its nourishment from one side only, as well as drain off a part of the moisture from its already contracted resources. It follows, therefore, that at the end of three or four years, when the hedge will require no further protection, the ditch should be filled, and the land brought into cultivation. I have already described the usual way of forming a hedge and ditch; but the plan is susceptible of a great improvement, which is as follows:—Suppose a plane surface: after the preparation of the soil, described elsewhere, insert the plants in an upright position with the roots inclining to the field side: at twelve inches behind the line thus formed by the plants, commences the side of the ditch, the mould from which should be thrown over the line of plants, in order to form a bank to protect the fence on the inner, or field side. At this rate, you have a ditch on the outer, and a bank of earth on the inner side, which latter, if topped with small branches or brushwood, will form a protection to the hedge as long as necessary. One of the common plans is to insert the thorns on the brink of the ditch, which is often washed in with rain; and again, the plants are not unfrequently placed on the top of the mound, instead of the surface, level with the adjoining land. It is moreover to be observed that the ridge or bank on the inner side must not be put close upon the roots, for access to air is indispensable to the proper performance of their functions. This is no doubt the reason why hedges buried under a high mound of earth succeed so indifferently. The accompanying sketch will perhaps give a better idea of what is meant. No. 1 represents the plane surface of the ground; 2, the bank of earth raised as a protection on one side to the hedge; 3, the hedge itself; and 4, the ditch as a protection on the other side of the newly



planted fence. It is necessary that the ditch should be made narrow at bottom, as it prevents cattle from walking in it, otherwise they are very apt to get into it for the purpose of cropping the young shoots. Hawthorn spray laid into the ditch will generally deter cattle from getting into it, and this precaution, as well as the narrow bottom, should be adopted. The plan pursued throughout the most parts of England, of forming a ridge or bank of soil, and planting the quicks on the top of it, is so thoroughly absurd, that one wonders how men conversant with the usual operation of the elements should have ever thought of it. No hedge can prosper if planted in this way. The rain comes, but it washes down the sides of the bank only; the sun shines upon it, but as there is no moisture in the ridge, his influences tend rather in this case to hinder vegetation: frosts loosen the surface, and the soil moulders away from the roots, which in the course of time are exposed for the searching winds to operate upon. Hence it is that throughout England there is not a single good close fence founded on this plan; the result being that, even after ten or sometimes fifteen years' nursing, the hedge has to be patched and mended with dead branches. In fact, if such a fence were to be kept clean, as all fences should be, this necessary operation would in the course of a year or two cause it to fall to pieces; for the roots of rank herb-*age*, brambles, &c., which surround it, bind the bank together, so that the weeds and rubbish may be truly said to *form a part of the system*. Added to this is the great width of the bank, raised, too, by impoverishing the soil on each side, which are in themselves sufficient reasons for rejecting this injurious though common mode of preparing sites for fences. The object of every planter and improver is to form at once an immediate and durable fence, and for this purpose there ought to be a more liberal provision made for the necessary expenses at its first formation. That there will be an ultimate saving, even in the space of five or six years, no one can doubt who studies the table (No. 20). Under all ordinary circumstances, where the soil is not too damp, my plan has been, after trenching and manuring (13), to plant on the plane surface of the ground, in which case the roots have the full benefit of the soil on both sides, the full benefit of the rains from heaven, and, instead of being baked by his rays, the full benefit of the sun also. In four years such a fence is strong and impenetrable, requiring no protection, and, if assisted by manuring its weak parts during its progress to maturity, presenting a beautiful, regular, and complete appearance.

15. *Time for planting.*—The best season for planting is immediately after the fall of the leaf in autumn; for at that juncture a tree is at complete rest, and has not commenced to prepare the

necessary secretion for its support during the following spring and summer. Let it prepare it therefore in its new station. There is a slight perspiratory action going on from the bark of trees even in winter, so that the more humid the atmosphere is the less will a plant suffer by being removed. Autumn, then, is on this account also the more eligible season. It is not to be denied that many hedges are planted and succeed tolerably in the months of February and March; but it is equally certain that in many seasons during these months the atmosphere is so cold and dry as materially to affect vegetation. I am confident the latter part of October and the commencement of November is the best time both for the hawthorns themselves, and for getting the best plants to be had at the nurseries.

16. *The choice of plants* is a subject on which a variety of opinion prevails, some maintaining that it is better even to sow the haws in the line where they are to remain. This mode, as also the planting of one or two years' seedlings, can never find general favour with planters, on account of the length of time exhausted in protecting the fence and consequent expense of cleaning; for a hedge which grows but slowly requires a great deal more attention than a strong one, which rapidly covers the soil and gets the mastery over the weeds. Generally, the age of plants used for fences is four years, either one-year seedlings, which, after being transplanted, have stood three years in lines, or two years' seedlings, which have stood two years in the nursery lines. The size, however, is of more importance than the age, and the thickness of the stem is to be looked to, and not the height of the plant. Those of the thickness of a man's finger, or such as are an inch and a half in circumference, are to be preferred to any other; and the oftener they have undergone the process of transplantation in the nursery the better will they be furnished with fibrous roots, a consideration which should be always borne in mind. There is a plan, not often practised by respectable nurserymen, but very common with market gardeners, of lifting a large quantity of the whitethorn at a certain time and binding them in bundles about the size of a sheaf of corn. Those bundles are taken to market with their roots exposed to the sun and wind at certain periods for a whole day, and if left unsold are taken home to undergo the same treatment till disposed of. Such plants are said to have "stood the market," and are quite worthless. Akin to this process is the nurseryman's practice of counting up several thousands of hawthorn plants, binding them in hundreds or in parcels of two or three hundreds each, and laying them so bound into the soil to await a customer, it may be, for several months. A great proportion of the plants so treated must die, because in covering them up the soil does not

get to the centre of the bundle, which usually falls a prey to the searching winds of spring. Plants which are so lifted before they are actually required should have the full benefit of the soil by being laid in thinly, so that the roots may not in any case touch or rest against each other. Of course, plants which have been lifted carefully, with few of their roots injured, are to be preferred to those which are in other respects better suited. A small plant, with its root uninjured, is better than a strong plant, as to size, with an indifferent root. Ignorant labourers and thoughtless gardeners pay little attention to the offices of roots, and hence it is that so many of the spongioles or extremities, by which alone the plant derives its nourishment, are barbarously detached through sheer carelessness. In selecting plants, therefore, the roots should be particularly examined.

17. *The preparation of the plants* consists in cutting off the tops to within 2 inches of the ground mark, so that when set they will appear this length above the surface of the soil. This is the only operation connected with hedge-fencing which I cannot exactly reconcile with physiological principles. Experience has always convinced me that the plants thrive better when so treated, though it is generally thought that the branches and leaves are required to assist in renovating the roots which suffer by transplantation.* Be this as it may, it is unquestionable that plants which are headed-down in the way recommended, shoot out much more vigorously than those which are planted with their tops on. The roots should not be touched with the pruning-knife at all, for the removal of every healthy root, and especially the spongioles, which are most apt to be removed, is the loss of as many life agents. Plants, indeed, under favourable circumstances, have the power of forming new spongioles, but this is by no means a reason

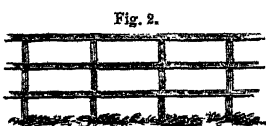
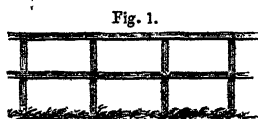
* About eight years ago I saw both methods pursued in adjoining fields by two different parties, and have since watched the result with some interest. By the one, a resident proprietor, who superintended the work himself, fine strong plants were put in with much care, but *cut down*. By the other, an absentee landlord, inferior plants were put in carelessly by contract, but *uncut*. In each case in the spring, but No. 2 rather later, with a dry succeeding summer, so that it had by no means as fair a chance as No. 1. In the winter following, No. 2 was cut down, and in about four years, notwithstanding the above and other disadvantages, it was nearly, if not quite, as good a fence as No. 1. It is true that neither was the treatment sufficiently similar in other respects, nor the result sufficiently decided to justify a positive preference, but it left a strong impression on my mind that if the trial had been perfectly *cæteris paribus*, the plants not cut till the subsequent winter would have carried the day. At all events the point should not be taken as decided till such trial has been made.—W. H. HYETT.

why those roots which are already formed should be displaced. It is also important that, previous to planting, the quicks should be sorted, as near as possible, to an uniform size; so that no plant may have the advantage over another in rising exuberantly to the detriment of its weaker neighbours, as is always the case when different sizes are used. Nurserymen in general make it a point to assort the plants in the proper method; but it is as well that planters should know the importance of getting them as near as possible of an equal size and description.

18. *In planting a hedge*, the first thing to be done is to stretch a line, so that it may run along the centre of the prepared ground. Close to this line, which will form one side of it, a perpendicular trench is to be opened with the spade, sufficiently deep and roomy to hold all the roots of the plants, which are to be placed 6 inches apart from each other, and as deep as they had been in the nursery lines. In cases where the plants are very strong, the space between each plant should be 8 inches. Over the roots a sufficient portion of mould is to be placed with the hand in order to keep them firm in their places, when an additional quantity is to be filled in with the spade. The line of plants is then to be trod gently, yet firmly, with the foot, when the remainder of the soil may be levelled in about the stems of the plants, and the surface finally smoothened with a garden-rake. The plan of planting with the dibble is highly improper, because it necessarily gathers all the roots together into a small compass; indeed, careless labourers will cut off the roots rather than take the trouble to put them all into the hole formed with the dibble. The opening of a trench with the plough is also to be condemned on account of its forming a firm smooth surface at bottom, through which the roots can with difficulty penetrate. It is, besides, impossible to do the work with any degree of neatness where the plough is introduced; but the chief consideration is, that where it is used the hedge will not grow so well as in those cases where the spade is adopted.

19. *Protection* should follow as a matter of course. Many a well-formed and carefully planted hedge is ruined for want of being guarded from the attacks of cattle browsing upon them; and many more are retarded by the fences set around them being either incomplete, or allowed, after any accidental inroad upon them, to remain without being mended. The nature of the protection will depend entirely on local circumstances. In all cases where wood is plentiful, posts and rails are to be adopted. The posts should be $4\frac{1}{2}$ feet in length, pointed or sharpened at the end with an axe, and driven into the ground with a mallet at the distance of $4\frac{1}{2}$ feet from each other, and to the depth of 15 inches.

This will leave the posts 3 feet 3 inches high. In cases where cattle only are to be kept off, 2 lines of rails will be sufficient (fig. 1); but in order to guard the hedge from the attacks of sheep as well as cattle, 3 horizontal rails should be used (fig. 2), the first one placed at 1 foot from the surface of the ground, the next at 2 feet from the ground, and the remaining one on the top of the posts. Various other contrivances have been adopted with wood, in order to protect hedges, but in no form has this material been used to such advantage as in the shape of posts and rails. Common hurdles, indeed, have in some instances been known to protect a hedge until it has arrived at maturity, but in general they are deficient in strength and firmness, while their cost is not less than that of the other. Mere brushwood, loppings of trees or old hedges, and all sorts of wattled works, however perfect in themselves, are not suited to resist cattle unless placed on the top of a bank, and this bank should be only adopted in conjunction with a ditch, as I shall notice presently. With the exception, then, of the posts and rails, and the various modifications of this kind of hedge-fencing, I do not hesitate to pronounce all other sorts of protection to a hedge, when used on the plane surface of a field, as inefficient, and a source only of continual trouble and expense. The other kind of protection to a newly planted hedge has been already adverted to (14), and consists of a ditch dug out on one side, and a bank formed on the other with the soil taken out of the ditch. This bank should be topped with any sort of strong underwood most convenient to be had, but the most effectual resistance to cattle is formed of the loppings of old hawthorn hedges, blackthorn, or sloe.



20. *Expense*.—This item will of course vary according to local circumstances, for in the neighbourhood of common pine and larch plantations, thinnings, or weedings, as they are termed in some counties, may be had at the rate of 3*d.* or 4*d.* per tree. In other districts as much as 10*d.* per tree is paid; and in some parts even a higher price is exacted. The cost of a perch of hedging complete, with protection on both sides, in the north of England, and throughout Scotland, does not exceed 3*s.* 3*d.*, the difference, as regards England generally, arising chiefly in the items of labour, wood to protect the fence, and the price of the plants. In the annexed tables a medium price is stated, which, though varying from the charge made in several localities, will be found to be, in the average of cases, correct.

TABLE I.—FOR CATTLE.

Cost per perch of 6 yards, on level surface, with posts and rails.

Trenching the soil $2\frac{1}{2}$ feet wide and $2\frac{1}{2}$ feet deep	0s. 2d.
Manure	0 2
Plants at 15s. per 1000 (6 plants per yard)	0 6½
Planting the same	0 1½
	<hr/> 1s. 0d.

Protection.

4 posts $4\frac{1}{2}$ feet in length	1 0
12 yards of rail	0 10
Nails	0 1
Labour	0 2
Carriage of posts and rails	0 2½
	<hr/> 2 3½

Cost with single fence complete per perch	3 3½
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Add	2 3½
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Cost with double fence complete per perch	5 7
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TABLE II.—FOR SHEEP.

Trenching, manure, plants, and planting, as detailed, Table I.

4 posts $4\frac{1}{2}$ feet in length	1 0
18 yards of rail	1 0
Nails	1 3
Nails	0 1½
Labour	0 2½
Carriage of posts and rails	0 2½

Cost with single fence complete	3 9½
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Add	2 9½
---------------	------

Cost with double fence complete	6 7
---------------------------------	-----

N.B.—From this and the foregoing estimate may be fairly deducted one-third of the expense for posts and rails, as many of them will serve for another hedge; thus reducing the cost of planting the hedge and protecting it from cattle to 3s. 9d. per perch, and that for planting and protecting it from sheep to 4s. 5d.

TABLE III.

Ditch and Bank Fence, where wood is scarce and high priced.

Preparing the soil, manure, plants, and planting as above	1s. 0d.
Casting a ditch on one side, 5 feet wide at top, 1 foot at bottom, and 3 feet in depth, and forming a bank on other side with the soil out of the ditch	2 6
Loss by additional space of land occupied by this method, compared with Tables I. and II. (average)	0 4
Topping the bank with brushwood or loppings (average)	0 7
	<hr/> 4 5.

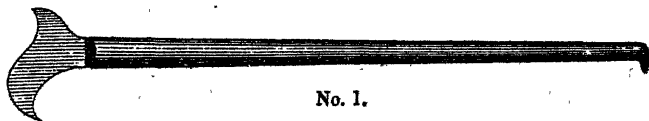
The foregoing will be found to be applicable to the generality of situations throughout the country; but in districts where game is plentiful it is necessary to protect with wattled, or what are usually termed wicker hurdles, which are closely woven with branches, and are sold in most cases for 8s. per dozen. Hares and rabbits are very destructive to young hedges, and where they abound the precaution recommended should be at once adopted. In the course of two years those hurdles may be removed, and if cattle are to be pastured near to the hedge, a more durable fence substituted. Those hurdles are made about 6 feet long, so that for a double fence six of them will be required in a perch. As already observed, they are closely woven, and quite sufficient to protect a hedge from all descriptions of game; but in inserting them many workmen thoughtlessly force their feet between the *weft* or horizontal branches of the hurdle, in order that by their weight they may the more readily force it into the ground. The open space thus left by the action of the feet is sufficient to admit hares and rabbits, so that the practice is on this account highly objectionable. A mallet applied to the upright parts of the hurdle is sufficient to fix it without any other means. The expense per perch with this sort of protection will be:—

Trenching, &c. as before	.	.	.	1s. 0d.
6 hurdles	.	.	.	4 0
Labour in setting them up	.	.	.	0 2
				<hr/>
				5 2

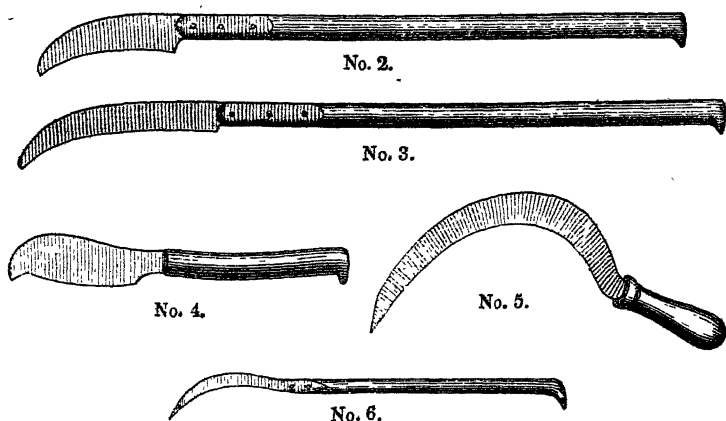
21. *Cleaning*.—When a hedge is planted, it should have the full benefit of the soil, and no weeds should be allowed to grow. Weeds rob the soil of its nourishment, choke the young plants, and prevent the rains from getting at their roots. The bottom of the hedge should be regularly hoed with a common hoe (for slovenly gardeners with a Dutch hoe leave half of the weeds around the stems of the plants), and the weeds raked off as soon as the hoeing is completed. There is no operation performed so abominably throughout England as that of hoeing. Whether it be turnips, cabbages, or hedge-bottoms, the same slovenly uniformity is observable throughout; and I almost despair of ever seeing this necessary work executed so well as it ought to be. The Scotch, who rather excel in *forming* hedge-fences, very much neglect the cleaning department. The English, again, clean not at all; for as already stated (14), the weeds and herbage, according to the present system, form a part of the hedge, and if they were regularly removed, the fence would be in danger of falling to pieces. It is impossible to lay down rules as to the periods when the hoeing and raking should be performed: it may be mentioned.

however, that so soon as the weeds appear they should be destroyed, and the timely execution of this work will save a great deal of expense and trouble. Nothing in the whole circle of gardening or agriculture has a better appearance than neatly kept hedge-bottoms, and nothing more bespeaks prevailing order throughout a garden, a farm, or an estate. Ivy and honeysuckle are to be treated in this case as weeds, and should be wholly eradicated. They overcome, and ultimately smother, all hedge-plants within their reach.

22. *Pruning or trimming.*—A hedge should not be pruned till the end of the third year, when it will require to be shaped and moulded to a certain degree of uniformity. The branches and leaves should be left untouched for this period, in order to strengthen the stems. No hedge can have strong stems unless the branches from those stems are allowed to grow, and the leaves on those branches to elaborate the sap fit for the support of the plant. This assertion is abundantly proved by every plant in a hedge which is allowed to shoot up into a tree; such plants in the course of a few years having stems many times thicker than any of the others which are regularly shorn of their foliage. In trimming the hawthorn, the hedge-shears should be discarded altogether, for they do not make a clean cut, and it is besides a tedious, and consequently an expensive method. The only implement which expert hedgers use is the hedge-bill, of which there are several varieties; and it is astonishing what beautiful work a dexterous hand executes with this tool. I annex a complete set of hedging-bills, or hooks, two of which are required in those cases only where the fence is allowed to fall into disorder, or wherever an old fence, as at present constituted, has to be remodelled so as to resemble as much as possible the modern improved fence. No. 1 represents a powerful tool used generally in cutting roots or strong stems near to the surface of the soil. No. 2 is also used for cutting strong branches in an upright direction. No. 3 is of a lighter description, and is employed in switching, brushing, or cutting off branches which have been allowed to remain on the hedge for two or more years. No. 4 is a powerful tool used for similar purposes as 1 and 2, and merely preferred by some workmen to those with longer handles. No. 5 is the stout reap-hook extensively used by the farmers of Norfolk for topping and trim-



No. 1.



ming fences where one and two years' spray has to be cut. The labourers throughout Norfolk use this hook with considerable dexterity, and effect very neat workmanship with it. It is well adapted for trimming the most improved sort of hedge-fences, and will no doubt become much more generally used than it has hitherto been. No. 6 is the implement I always use for trimming hedges, and it is the favourite with all hedgers throughout England and Scotland. It is extremely light, and may be easily worked with one hand. It is adapted only for one year's growth, and when kept sharp, which is done with a scythe-stone, it may be made to cut as smoothly as when hedge-shears are used, and much more rapidly. The time at which the dressing should be performed depends entirely upon circumstances. If a hedge is not vigorous, and an increase of strength be desirable, pruning should be performed during the latter part of October, because the sap and sustenance which the roots attract from the earth during winter will go then to the remaining branches, causing them to push next spring with unusual vigour. On the other hand, if vigour in a hedge is to be discouraged, the rule is to defer pruning till spring, when the food which the plant has been accumulating during winter will be removed in a certain proportion along with the branches then displaced; or the same end will be accomplished if the hedge is pruned in September, before the descent of the sap has taken place. Unprincipled men are very fond of dressing the hedges at the wrong season, on account of its being much easier to do so when the branches are full of sap, than in the winter time when they are hard and dry. The shape to which fences should be pruned is universally admitted to be that represented by a narrow letter A, broad at bottom, and gradually tapering to the top, or as represented in the annexed section:—



The Scotch call it the wedge shape. Five feet is the height to which a hedge should be kept throughout all arable lands; for if allowed to become higher, it is unmanageable, and a source of great expense to keep in order. The width of a hedge should not in general exceed 3 feet at bottom, and in many cases 2 feet or $2\frac{1}{2}$ feet will be sufficient. In certain meadow grounds, where it is desirable that the hedge should afford continual shelter to cattle pasturing, 6 or 7 feet in height may be allowable, as also an additional half foot, or even a foot in width.

The Sloe—*Prunus spinosa*.

23. This plant is by some called the Spring Plum; by others, the Sloe Thorn; but most generally it goes under the name of the Sloe, or Blackthorn. In situations where the soil is loamy and not overcharged with moisture, this shrub is found to answer very well for the purpose of fences. It grows rapidly, has formidable spines, and is very lasting. It has no claim upon our attention, however, beyond the hawthorn, whilst it falls very short of having all the recommendations applicable to that tree. The great fault of the sloe is its suckers, which it sends up in such profusion as to threaten the usurpation of whole fields in its neighbourhood. The plants should be invariably grown from seeds, in which case few or no suckers will rise from the roots. The fruit are ripe in October, when they should be gathered and laid in a heap, mixed with sand, in the open air, and turned over several times during winter until the pulp is decomposed. Advantage should be taken of open weather during January for the purpose of sowing them, which should be done in beds, with a covering of an inch and a quarter in depth. When two years old they should be transplanted into rows to remain for one year, when they will be fit to be removed into hedge-lines as recommended for the hawthorn, to which reference is made for all necessary instructions. The sloe being deciduous, it is to be planted chiefly to divide arable fields.

The Crab, or Wild Apple—*Pyrus malus*.

24. When strong plants of this tree are used, they will form a fence even in a shorter time than the hawthorn. They should be selected of six or seven years' age, the tops cut off to within four

or five inches of the root, and planted at a foot apart. In rich, well-prepared soil, a bush of shoots will rise from each stool, many of which will measure three feet in length and be robust in proportion; but it has one great disqualification which alone prevents it from being in general use—its liability to be attacked by caterpillars. So fond are these insects of fastening upon this tree that I have often seen the leaves for hundreds of yards completely eaten off by them; and when this takes place before the hedge has arrived at maturity, the damage is almost irreparable. It often happens that for several years a fence of this description may remain unattacked; and on the other hand it as frequently occurs that for two or three years successively they become a prey to those insects. In planting a hedge of this description it is very important to ascertain that the plants used have been raised from the true wild crab; for such as are raised from the seeds of cultivated apples, and even cultivated wildlings, are found to be almost thornless, and consequently unfit for the purposes of defence. Reckoning the cost of the plants at 1*d.* each, a price at which they may be had at any nursery, the expense of forming the hedge complete, without fencing, would be 1*s.* 10*d.* per perch, being 10*d.* more than the cost of a hawthorn fence for the same space. For the information of those who are desirous of raising the plants, I annex the process:—When the crabs are gathered, which will be in October, they should be carried to a rot-heap in the open air and mixed with mould to hasten decomposition. If turned several times during winter, the pulp will be so completely rotten that the seeds will be found detached from it sufficiently to ensure germination when sown, which should be attended to during open weather in the month of March. They should be covered to the depth of an inch, and when two years old transplanted into nursery lines, there to remain for a similar time, when they should undergo another transplantation for one year previous to their being planted finally out. Thus they will be five years old. At the end of three years, the hedge formed of such plants should be pruned or switched with a hedge-bill into a regular form, as recommended for the hawthorn, and at four years old it will be strong enough to stand unprotected as a fence. In grounds near to dwellings, or of an ornamental character, unfrequented by passengers, it would confer great beauty if a strong plant was left every twenty yards to shoot up into a tree, to be grafted with one or other of the ornamental Siberian crabs, or some of the smaller cider apples which have little or no shade.

The Holly—*Ilex aquifolium*.

25. For home districts, and especially for grazing grounds, no tree presents so many qualifications for a hedge as the holly.

Being a close-growing shrub, and an evergreen, it forms a most desirable shelter for cattle pasturing in fields surrounded by it; and as it grows much better than the hawthorn under hedge-row trees (which are absolutely necessary around grazing lands), it ought in every case to be adopted in enclosing meadows and pastures not overcharged with moisture. It is, besides, a much more beautiful object than the hawthorn; and being recommended near to dwellings, it is important to recollect that it is a tree which does not exhale any perceptible vapour. Added to these are the following important considerations:—1st, its keeping itself almost free from weeds, for from the closeness of its branches at bottom it excludes the air so effectually that none can grow; 2dly, its not being liable to the attacks of any insects; and 3dly, its not being resorted to by birds. The reasons why it has not been so generally adopted as it deserves are, 1st, a prevalent idea that it is a slow grower; and 2dly, the high price of the plants. A strict compliance with the rules laid down for the preparation of the soil (27) and for the choice of plants (30) will obviate the first objection; and the other may be modified considerably by every one raising the plants for himself, agreeably to the instructions detailed (35).

26. *Soil and situation.*—Let no one be deterred from planting the holly from an idea that the soil is not suitable for it, providing it is not bog land, or soil absolutely saturated with wet. It certainly triumphs over more varied localities than the hawthorn: it is found flourishing on dry gravelly land as well as on strong clay. Sand, and sandy loam, are the soils it delights in most, and when it meets with these it shoots up luxuriantly.

27. *Preparation of the soil.*—As in the case of the hawthorn and all other hedge trees, the site intended for the holly should be trenched and manured several months before the time of planting. The trench in this case I would recommend to be a yard in width, and at least a yard in depth. It matters not what sort of manure be used, for by the time the soil is turned up all sorts will be pretty well reduced to a certain quality. The chief thing is to have the soil loose and fertile, and to accomplish the latter nothing can be better than well-rotted farm-yard manure. By the deep trenching recommended, the soil will be raised about half a foot higher than it was before, but it will afterwards sink down, so that none of it should be removed.

28. *Site for the plants.*—The plane surface, with a fence on either side, is best; but where the materials for fencing cannot be procured, cast a ditch on one side and raise a mound on the other with the soil taken out of the ditch, and if the soil should be insufficient for that purpose, top it with dead branches such as can be got in the neighbourhood. The bank raised must not be imme-

diately over the roots of the plants, for a certain degree of air is necessary to their free development: the side of it, therefore, should be fifteen inches away from the plants.

29. *Time for planting.*—The best season for planting is from November till March; for though the holly and all evergreens are often removed during summer, the most eligible season must be that in which there is the least chance of their being affected by evaporation. The particular day to be chosen is when the atmosphere is humid, and the elements still; for though some may think these unnecessary precautions, they will assuredly tell well on the first year's growth of the plants. It must be remembered that the holly is rather a shy plant to remove; hence the necessity of choosing the cloudiest weather for the purpose.

30. *Choice of plants.*—No plants should be used unless those which had been transplanted the previous year, in which case every plant will be furnished with an abundance of fibrous roots; and though they may not look so well as those which had stood in one place for two or three years, yet their certainty of growing overbalances every other consideration. Plants of six to ten years of age should be preferred to younger ones, for young plants are proverbial for the slowness of their growth; but when they get to about eight years of age they commence to grow rapidly. They require no preparation either by pruning the root or the top. Where the distance is not great, balls of earth may be carried with the plants, and this precaution will still further ensure their vigorous growth even the first season.

31. *Planting the holly.*—This is accomplished by setting the line, and opening a straight trench or furrow with the spade, as recommended for the hawthorn. In this trench the plants should be set upright and close to the side of the trench, so that a straight line may be formed by them. The distance between the plants should be at least a foot, and in cases where they are very bushy fifteen inches apart will be close enough. They should be planted about half an inch deeper than they stood before, and the soil, laid immediately to their roots, should if possible be pulverized. In order that they may stand firm and upright they should be trod gently immediately after the roots are covered; and during this operation the best opportunity presents itself for adjusting such of the plants as do not fall in exactly to the straight line. By taking hold of the top and treading the root at the same time any plant may be easily made to assume its proper position.

32. *Pruning and after-management.*—For the first two seasons the hedge will require no pruning, but after the third year such parts of the sides as become broad and irregular had better be clipped into uniformity. I say *clipped*, meaning by the hedge shears, for the holly is too thick, and its leaves too numerous, to

allow of its being trimmed with a hedge-bill. I have been long anxious for such an opportunity as the present to enforce the necessity of taking the management of fences out of the hands of ignorant though well-meaning labourers, who have little idea of beauty and order, and who are very unfit to perform the nice operation of managing hedges. But the question is, who else are to look after them? Gardeners are not always on the spot, and even if they were, a great many of them are void of education on this head, and I may add, as careless as labourers. I have no doubt that the impulse given to a better system of hedge-fencing by the Royal Agricultural Society, will in the course of a few years lead to the introduction all over the country of regularly trained hedgers, whose sole business will be to manage the fences upon an estate. In Berwickshire this class of men is as well known as that of gardeners; and throughout many parts of Scotland, even as far north as Moray and Inverness, the office of a hedger is quite common. I do not mean to say that every farmer should have a man set apart to take charge of the fences upon his land; but it is quite clear that if they were kept on all large estates, the influence of example, seen in well-kept fences, would soon beget a desire in others to imitate such patterns. A holly hedge is considered at maturity when it reaches the height of six feet, beyond which it should not be allowed to grow, unless in special cases; for if higher the expense of clipping is very much increased. It should be perfectly straight, broad at bottom, and gradually tapering to the top, somewhat in the shape of a narrow letter A. The time for clipping is October, and it is not necessary that this should be performed oftener than once every year.

33. *Cleaning.*—This is all-important in hedge fencing, as it is in every other department of agriculture. Hedge fences are too often nurseries for weeds, which are allowed to ripen their seeds, ready at all seasons to be disseminated throughout the adjacent fields. I need scarcely add that the soil, of itself, will no more produce weeds than it will in like way produce foreign timber trees, so that, if every one would be careful to cut them off before they got to maturity, we should have much less labour and trouble in cleaning. Not one man in twenty understands what it is to hoe and rake the ground in perfection, for, according to the present practice of those who presumptuously call themselves gardeners, at least one fourth part of the weeds are allowed to remain untouched, and very generally to ripen and disseminate their seeds. Holly hedges are much easier to keep free from weeds than any other sort of fence, on account of the plants growing so close to the surface of the soil, and thus choking the herbage. Few or no weeds will be found under the hedge, but the outsides should of course be kept as clean as that which is shaded by the branches.

Under ordinary circumstances, the hoeing and raking would not be required oftener than three times during a season, viz., in May, July, and September; but during wet summers, favourable to the growth of weeds, an additional cleaning would be required.

34. *Expense*.—This will vary a little according to circumstances, but the following may be taken as the average per perch of six yards:—

No. I.		s.	d.	
Trenching 3 feet wide and 3 feet deep	.	0	3	
Manure	.	0	3	
Plants 18 inches high, 8 years old, at 60s.				
per 1000, 12 to 15 inches apart	.	1	0	
Planting the same	.	0	2	s. d.
				1 8
Fence on each side to protect the hedge as detailed (20)		4	7	
				<hr/>
Cost of hedge with double fence complete, per perch		6	3	

Plants from nine to twelve inches high are sold in the nurseries at 30s. per 1000; but as those would prolong the expense of fencing for several years, it is considered better to plant such as are eighteen inches high and of a greater age. As already observed, the latter, when once established in their final situation, will shoot up more vigorously even than the hawthorn or any other fence plant.

No. II.		s.	d.
Expense of hedge as above	.	1	8
Digging out ditch on one side and forming bank on			
other, with the soil dug out	.	3	8
		<hr/>	
		5	4

Here there is an apparent saving of 11*d.* per perch; but it is to be reckoned that the space occupied by the ditch, added to that taken up by the bank, is much greater than would be required for a fence of wood on each side. There is also a difference in favour of the first plan with regard to the growth of the hedge, it being universally admitted that in the generality of soils the plane surface is to be preferred to any other site.

35. *Mode of growing the young plants*.—I annex the nursery culture of this tree on account of its being comparatively an expensive plant to procure of nurserymen. I do this in order that every person may rear the plants for himself, and thus save one of the chief items in the foregoing tables. It is known to every one that the holly is a most plentiful bearer of seed, being in most seasons literally clad with beautiful scarlet berries which, with the branch, are generally called "Christmas." Those berries are

perfectly ripe in November and December, when they should be gathered, and after being mixed with sand, laid in a pit in the open ground till the December following; that is, for twelve months, when they should be sown during open weather. When in the pit, they should be turned over frequently so as to hasten the rotting of the pulp in which they are encased. The soil in which they are sown should be free sandy loam, shaded if possible from the south, so that the sun may not dry up the beds. For the sake of weeding them conveniently, those beds should not be more than four feet or four feet and a half wide, the soil should be made soft and fine by raking it, and the depth to which they should be covered is from a quarter to half an inch. I do not approve of sowing the seeds immediately after their being gathered, because, 1st, there is the loss for one year of the soil which they occupy; 2nd, there is the cleaning of the space for a like period; and 3rdly, the soil lying undisturbed so long gets so firm as to materially hinder the growth of the tender plants when they do appear. The young plants will begin to spring in May and June, and should be kept perfectly free from weeds. At the end of the second season, during the months of November and December, the plants should be removed into lines about a foot distant from each other, and the plants placed about four inches apart. Here they should remain for two years, when they should be again removed into lines eighteen inches apart, and the plants placed about six inches from each other: in those lines they are to remain for a similar period. The plants will now be six years old, and if they have grown freely, they will be fit in another year to take their place as fence plants. With this view, therefore, they should be again removed into lines twenty inches or two feet apart, and placed in those lines about a foot distant from each other, here to remain, as stated, for one year. When lifted, such plants will have large bushy roots, and nothing but the grossest carelessness will prevent them from forming in a short time a beautiful and durable fence.

The Beech—*Fagus sylvatica*.

36. This tree grows rapidly on all prepared soils, and forms a very beautiful fence. In rich soil, it retains a great proportion of its leaves in a withered state during winter; and is on this account excellent for nursing early grass on such lands as are set apart for feeding and fattening different kinds of live stock. Its only defect is a want of that rigidity so striking in the whitethorn and crab; hence it cannot in all cases be safely trusted where cattle are grazing, unless it be protected by a ditch next to the field where they usually are. This circumstance, however, is capable of being turned to good account in soils naturally too damp for it, where a ditch would be required as well for the draining of the

land as for a protection to the hedge. In fencing such land, then, let a ditch be dug out on the field side as already detailed (14), 5 feet in width at top, 3 feet in depth, and 1 foot wide at bottom: the soil from the ditch is to be thrown over the line intended for the hedge (not as a bank on which to plant it, as is usually done, but for a fence to it), and the hedge itself is to be planted parallel with the ditch at about 9 inches from the edge of it. With regard to this tree, it may be stated that in the colder and more exposed tracts of arable and pasture lands, as well as on those which are too damp for the hawthorn, it is better adapted than any other tree. Thus it becomes on the one hand a link between the hawthorn and the furze, and on the other between the hawthorn and the willow, poplar, &c. In order to give a higher degree of rigidity to a beech fence I have in several instances planted a double line of plants, and I have no doubt that this plan will obviate the defect alluded to, but as yet my hedges have not been long enough planted to prove this position. Between the parallel lines I leave a space of 18 inches, so that the stems of the plants when grown up form a sort of strong framework on either side, which I am persuaded no description of cattle will be able to break through. Between each plant in the lines a space of 15 inches should be left; and, as pointed out with regard to every other tree, no weeds should be allowed to rise amongst the plants or near to them. The time to clip is the month of October, and the form to which hedges of this description should be moulded is the same as that recommended in the case of the hawthorn. From the facility with which it may be reared, its quickness of growth, and the valuable protection it affords to cattle in pasture lands, this tree certainly deserves to be planted more universally than it has hitherto been. From the nature of the young shoots the hedge-bill cannot be advantageously employed in trimming the beech; yet it may be remarked that no tree so well repays the expense of clipping, for during summer time it is of all others the most ornamental.

The Hornbeam—*Carpinus betulus*.

The Elm—*Ulmus campestris*.

37. These trees are sometimes used for fences; but neither of them has anything to recommend them in preference to the beech. Indeed, the hornbeam is in many respects so like the beech that at a distance it is often mistaken for it. One consideration in favour of the beech over both these trees is, that nurserymen sell the plants at a few shillings less per thousand than they charge for hornbeam, and at a considerable price less than what is demanded for elm. Like the beech, these trees are chiefly valuable in forming fences around pasture lands.

SECT. II.—*Hedges for exposed situations where the soil is poor, yet capable of improvement.*

38. There are few plants suited to withstand the rigour of severe winters sufficiently to form fences in high situations; and those which are adapted for this purpose are to be considered chiefly as the forerunners of the beech and whitethorn. There are indeed certain situations, though few, where it would be an act of folly to be at the expense of planting any fences with the view of sheltering and ultimately reclaiming the land for cultivation. Rocky surfaces, such as cannot be subjected to the plough, belong simply to the province of the planter. Thin gravelly districts, where herbage refuses to take root, are also to be left to be covered with ligneous vegetation, as are all those lands lying on rock, or which otherwise have such a retentive subsoil that the water stagnates upon them. At the same time, the mere altitude of lands ought to form no barrier to the introduction of hedge plants, so long as we have a few prepared to take their station in the shape of fences in *any situation*: the chief thing to be considered being whether or not the soil purposed to be enclosed is likely to become fit for tillage.

The Scotch Pine—*Pinus sylvestris*.

39. Of all the trees suited to the climate of Britain, this tree is perhaps the most serviceable. If the cold and wintry uplands of the North are to be brought into cultivation, it will be by the aid of this tree, either in hedges or strips, or in larger masses as nurseries to other trees. ~~In no soil does it refuse to grow. In peat, sand, gravel, granite, and all thin soils, it rises rapidly, and forms a strong rough fence in the course of six or seven years.~~ In the neighbourhood of Thetford and Newmarket, in Suffolk, where the soil is miserable, it is quite common as a hedge tree; but in those places it is pruned in the same way as the whitethorn, which is certainly disadvantageous; it being well known that of all trees the pine is the most impatient of the knife. It is only where a better tree, as a fence, will not grow, that I am led to recommend the Scotch pine, and this I do, as already stated, because it is admirably adapted for ameliorating the climate in exposed situations previous to the introduction of others. My plan with this tree is as follows:—The soil requires no preparation whatever. The plants to be used should be 4 years old, and they can be had of nurserymen for 4s. or 5s. per 1000. Those plants I insert in a straight line at 2 feet apart from each other, so that when they get up, the stems may form the chief part of the fence. Planted at this distance, there will be very little room for branches between the trees in the lines, but they will push

out luxuriously on each side and produce sufficient spray to keep the plants in a healthy state. The tips of the strongest side branches should be cut off, so as to induce smaller ones to break forth, but no regular system of pruning should be adopted. Another parallel line is to be formed and planted in like manner, about 6 yards distant from the other: this distance I adopt, so that the roots of the trees may not impoverish or reach the soil in the centre, which at the proper season should be planted with the whitethorn or beech after the ground is trenched in the usual way. Between the parallel lines, at considerable distances, there should be cross lines planted so as to break any currents of wind, which are oftentimes hurtful in open avenues of this description. If the soil is tolerable, and the climate permit, the whitethorn-hedge may be introduced 3 years after the planting of the pines; but in the more exposed places, it should be deferred for a year or two longer, when the screen on either side will be in a more complete state to protect it. At the end of the three years, the beech may with every prospect of success be introduced.

The Furze—*Ulex Europæa*.

40. In very cold elevated districts, where others will not thrive, this shrub makes a beautiful and useful fence—beautiful from its having such a profusion of bloom, and useful because it is cropped in winter by sheep, and the clippings eaten by cattle and horses. It is short-lived, however, and is subject to be killed down during severe winters. It is apt, also, to become bare and unsightly at bottom. In forming a hedge of this shrub, the plan pursued at present throughout most parts of England with regard to the whitethorn is to be adopted. A bank of earth is to be raised 5 feet wide at bottom, $3\frac{1}{2}$ feet high, and 20 inches wide at top. At the proper season, which is in March, a drill is to be drawn on the top along the middle of the bank, and the seeds sown therein, and covered to the depth of 1 inch. In the course of two years the plants will begin to grow luxuriantly, spreading downwards on each side over the bank, so as almost to cover the whole of its surface. This fence should be regularly clipped once a-year, between November and March, and of course the particular time will be regulated by the demand for the clippings as fodder.

SECT. III.—*Hedges for situations where the soil is damp and boggy.*

41. For this section nature seems to have given us no trees or shrubs remarkable for their stability or rigidity. They are all soft-wooded, without prickles, open growers, but compensating for those deficiencies in the quickness of their growth. With such

materials, it is clear that an open ditch is an important and indispensable accompaniment.

The Elder—*Sambucus nigra*.

42. This tree is remarkable for the ease with which it may be cultivated, its rapidity of growth, and the cheapness attending its formation into a fence. Trenching the ground in this case may be dispensed with, for if the soil is dug over one foot deep the roots will find their way into any damp soil. Even rooted plants need not be used, but cuttings or truncheons inserted instead of them. A ditch should be cast as a fence on one side, and the soil taken out of the ditch should form a bank on the other. This hedge should be trimmed with a hedge-bill at the end of the first year, and every subsequent year, as recommended for the others. In such parts as have failed, fresh plants with roots should be inserted in the ensuing autumn, and at the end of 3 years the bank may be removed.

The Lombardy Poplar—*Populus fastigiata*.

The Black Italian Poplar—*Populus monilifera*.

43. Both these trees are admirably fitted as fences in moist soils. Plants one year old, which are generally about 4 feet in height, may be had at the nurseries at 1*d.* each, and those will form a tolerable hedge the first year. If the soil is dug over and manured several months previous to planting, strong cuttings may be inserted about a foot apart, and these will make shoots varying from 3 to 5 feet in height during the first season. At the end of the second year, during the month of November, the top of the fence should be regularly reduced with a hedge-bill to the height of 5 feet. This will strengthen the sides of the fence, and consequently increase the stability of the stems. A very good plan is to tie rods of wood to the young trees at 2 or 3 feet from the ground, until they have become sufficiently strong of themselves to resist the pressure of cattle. When properly attended to, by keeping them free from weeds, and trimming them regularly every autumn, those fences become highly useful and ornamental, and are at once amongst the cheapest and readiest of any that can be raised. The form of the hedge should be the same as that of the hawthorn, only a little wider at bottom, and trimmed up in a wedge-like shape as already explained.

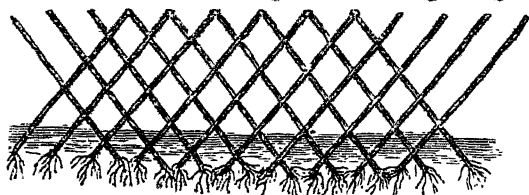
The Alder—*Alnus glutinosa*.

44. As a hedge plant, the alder is not so good as the poplar; but as it is the most aquatic British tree that we have, it is worthy of being mentioned here as suitable to a class of soils and situations in which the poplar will not grow freely. It delights in wet swampy lands, and will grow tolerably even in the water. The

plants for fences should be 4 years old, not more, because when older they are generally devoid of branches at bottom. They may be set at a foot apart, and treated in every respect like the poplar, trimming the fence with a hedge-bill, and keeping it at the height of 5 feet. The alder will make a strong branchy fence, though not very close, and if pruned regularly as directed, it is susceptible of a neatness in appearance much beyond what is generally believed of it. Few have the courage to keep it in subjection, being a tree of extraordinary exuberance, and striving for the first few years to put forth a leader, or in other words, to assume its tree-like shape. Afterwards, however, it seems to get reconciled to the form of the fence, which is to be accounted for by its producing, after repeated prunings, smaller spray or branches which are more equally supported with nourishment and become luxuriant all over.

The Goat Willow—*Salix caprea*.

45. As every one knows, the willow generally is a quick grower, and delights in moist land; but it by no means follows that every willow is alike suited for fences, for very few of them are rigid enough to resist any pressure. I have therefore selected the species which possesses the requisite quality in the highest degree; and as it is not always known by the name of the "Goat Willow," I may mention that it is called the Black Sallow, and in the north of England, the Saugh. In spring it puts forth beautiful yellow catkins or blossoms before the leaves appear; those flowers are gathered by children on Easter Sunday, under the name of "Palms;" and it may help some persons to the right species, when I inform them that the first time bees are seen abroad in the spring is when on their way to the flowering branches of this tree. The best and cheapest way to form a fence of this tree is to procure a number of straight shoots 2 or 3 years old, about 6 feet in length, and insert them in the soil to the depth of 15 inches, and at the distance of 18 inches from each other, crossing the rods at right angles, thus:—



This will form a pretty good hedge even the first year; and by trimming it with the hedge-bill as recommended for the others, it will be strong enough at the end of the second season to be left unprotected as a fence.

CHAP. III.—*Tree culture apart from Hedge-rows, and the necessity of planting fence-wood, &c.*

46. It is unquestionable that herbage succeeds best in close situations: corn thrives best and yields most in open, unsheltered places, where there is a free ventilation. Again: the air may pass too freely or rapidly over the country for the rearing and fattening of animals, which, it is found, thrive best when sheltered during the cold months and shaded during the summer time. Hence it is that for this purpose graziers consider fifty acres divided into five inclosures equal to sixty acres in one inclosure. In short, I believe it to be beyond controversy that permanent pastures and meadow lands should have trees about them; and that corn lands should, if possible, be without them. It remains for me, therefore, to urge the necessity of forming the hedge-line around pastures entirely of hedge plants, and placing the trees, wherever practicable, at about two feet behind the hedge. On road-sides the trees will have to be planted within the hedge, but in whichever case it may happen it is absolutely necessary to diverge from the hedge-line so far as that the trunk of the tree when grown up shall not interfere with the outline of the fence. Were it not considered indispensable to maintain in some measure that characteristic feature of English scenery—its hedge-row trees—I should be inclined to recommend, instead of them, strips of close plantations altogether apart and away from the fence, so that the hedge might escape their drip and shade; but as it would be in vain to attempt such an innovation, I am content to recommend that the trees planted as hedge-row timber should not interfere so closely as they do at present with the form of the hedge.

With corn-lands it is quite another matter. Except in extreme cases, such as where the lands are high and very much exposed, it is my firm conviction that they should not be planted; and as it will be asked, no doubt, how I should dispose of them, or where I should plant the trees, I would earnestly recommend that they should be for the future cultivated more extensively on our waste lands, *by themselves*, in woods, in strips, in circles where the fences intersect each other, or in such other way as local circumstances might suggest, so as not to interfere with the growth of green crops. In itself, the disposition of our hedge-row trees is without much beauty; and our attachment to a form so regular and monotonous is chiefly to be attributed, I think, to old custom; though it must be confessed that their being cast about a field so universally gives the country a somewhat rich and sheltered appearance. However, it is not to be doubted that those who shall have the courage to throw their corn-fields open to the influences of an

abundance of light and air will reap their reward in more bountiful crops.

I shall be here allowed, I trust, to urge upon landed proprietors, and planters in general, the necessity of growing for themselves larch and Scotch pine trees wherever they have a waste piece of ground. The great want of wood for fencing young hedges is the chief cause of our fields being intersected with those clumsy military-like fortifications which absorb so much of the best land in England. From the days of Johnson to the present time, it has been the reproach of Scotland that it is without timber-trees: this is so far correct, yet it is equally true that the Scotch people have planted trees to supply their more urgent wants, whilst England, though reposing all over under a broad umbrageous canopy, is not in reality in possession of the timber she is most in want of. If even an outhouse has to be built, the poor cannot do it, for deal wood is either not to be had or it is held at such a high price that they are unable to purchase it. If a young hedge has to be fenced, the same reasons interpose to prevent its being done, and hence the rude banks which are thrown up to divide fields between man and man. It is not to be expected that in this essay the details of planting the trees should be entered upon; but it may be mentioned that, in order to be serviceable for the purpose alluded to, they should stand very close to each other, so that they may be drawn up to a considerable length without great thickness. The larch and Scotch pine will grow on any sort of land, not absolutely saturated with moisture, and in any situation except close to the sea. For these trees no land is too poor, for even in beds of gravel they will reach a timber-like size in the course of fifteen years. The old Scotch pine, or Highland pine, as it is called (*Pinus sylvestris horizontalis*) should be preferred to the common tree (*Pinus sylvestris*), the wood of the latter being soft and porous, whilst that of the other, to use the words of Loudon, "remains fresh, embalmed in its own turpentine."

In reconstructing the fences throughout England, the advantage of retaining some of those at present in use as a protection to those founded upon a better plan, is too obvious to require being enforced; and the only precaution which it seems necessary to allude to, is, that the new hedges should not be planted so near to the others as to be injured by the shade of their overhanging branches.

Norwich.

XXI.—*Report to the Honourable Robert Henry Clive of his Poles Farm Improvements, effected by Thorough Draining.* Continued from Journal, vol. iv., p. 177.

SIR,—Since my report to you in March, 1843, I now beg leave to state what further improvements have taken place, and I think I cannot do better than continue the plan upon which I commenced, viz., by bringing forward the abstract quantity of thorough draining and subsoil ploughing to that period, and adding thereto in detail what has been effected subsequently, together with an account of the success obtained, and other matters connected with the improvements; and in doing so I will endeavour to make the statement and report clear, beginning with the quantities done since my report in March, 1843, which I will add to the former quantities and expense, showing the full amount of expenditure; but I beg leave here to state the quantity of acres the farm contains in arable, meadow, and pasture, viz.—

	A.	R.	P.
Arable	125	3	16
Meadow	45	0	29
Old pasture	50	0	29
One and two year old leys for permanent pasture	21	3	24
Farm-house, fold, stackyard, cottages, &c.	2	3	17
Total	245	3	35

No. 13, 14A. 2R. OP.—9038 yards. This field was an old coarse sward, with a very uneven surface. The surface and subsoil vary much; part of it is a tolerable loam, part a stiff clay substratum, with very large pebbles imbedded, which the subsoil-plough turned out to some extent, and a small part shelly sandstone. The drains are 18 feet and 24 feet apart; drained in 1842; a great part of the stone got in the field and wheeled to the drains.

Getting the stone, wheeling to drains, cutting drains open, breaking the stone, putting it in, and filling up drains,

1129½ roods (of 8 yards per rood) at 10d. per rood . . .	£47	1	5
Getting 160 yards of stone, at 5d. per yard	3	6	8
Four horses 4½ days carrying the above stone to drains, at 12s.	2	14	0
Subsoil ploughing 14½ acres, at 21s.	15	4	6
	£68	6	7
Cost per acre	£4	14	3

No. 14.—3A. 2R. 8P.—1764 yards. This field is an orchard in grass, which has been planted a good many years; some of the trees are dead, I think a good deal owing to the cold substratum, which is a stiff clay. The drains are put in the centre between each row of trees, which are 30 feet apart; most of the drains were opened to the depth of 15 inches with drain-plough, afterwards cutting a further depth of 15 inches, the other drains 30 inches and 36 inches, at 6*d.*, 8*d.*, and 10*d.*, breaking the stone, putting in drains and filling in

in	£6 13 0
Getting 100 yards of stone, at 5 <i>d.</i>	2 1 8
Four horses carting stone to drains 2½ days, at 12 <i>s.</i>	1 10 0
Six ditto opening drains with plough half a day, at 18 <i>s.</i>	0 9 0
	<hr/>
	£10 13 8

Cost per acre	£3 0 10
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No. 15.—11A. 2R. 12P.—9696 yards. This field is an old coarse pasture, varying much in surface, and substratum very cold. The drains are 16 feet apart; the greatest part of the stone got in the field, and wheeled to the drains.

Getting stone, cutting drains, breaking stone, wheeling to drains, laying and filling in 1212 roods, at 11 <i>d.</i> (of 8 yards)	£55 11 0
Gathering and carrying 22 loads of stone from adjoining field, at 1 <i>s.</i>	1 2 0
	<hr/>
	£56 13 0

Cost per acre	4 18 6
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No. 16.—6A. 0R. 4P.—3536 yards. This field is an old coarse turf, varying in quality, but, being near the homestead, it is intended to improve the surface by top-dressing, and it continues in permanent pasture. The drains are 21 feet and 24 feet apart: 442 roods (or 3536 yards). Cutting open, breaking stone, laying drains, and filling in,

at 7 <i>d.</i> per rood	£12 17 10
Seven roods of open ditch-laying, at 1 <i>s.</i>	0 7 0
Getting 200 yards of stone, at 5 <i>d.</i>	4 3 4
Four horses carrying stone to drains 3 days, at 12 <i>s.</i>	1 16 0
Filling 200 yards of stone into carts, at 1 <i>d.</i>	0 16 8
	<hr/>
	£20 0 10

Cost per acre	3 6 9
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No. 17.—4A. 3R. 25P.—2956 yards. This is a rough piece of ground, with a very uneven surface, substratum chiefly clay loam; it is a question at present whether it will be continued in permanent grass or undergo a course or two of tillage to improve the surface. The drains are 24 feet apart: 369½ roods (or 2965 yards) of drains.

Cutting open, breaking stone, laying drains, and filling in,			
at 7d. per rood	£10	15	6
Getting 155 yards of stone, at 5d.	3	4	7
Carting and wheeling stone to drains, 4 horses 3½ days,			
at 12s.	2	4	9
Filling stone into carts	0	10	0
	<hr/>		
	£16	14	10
	<hr/>		
Cost per acre	3	10	0

No. 18.—6A. 2R. 0P.—3024 yards. This is a rough, coarse herbage, and should undergo a course of tillage to improve and make the surface more even. It is chiefly a clay loam, and the drains vary from 24 feet and upwards apart.

Cutting open, breaking stones, laying drains, and filling in			
378 roods (of 8 yards per rood), at 7d.	£11	0	6
Getting and wheeling stone to 300 roods, at 3d.	3	15	0
Thirty yards of stone, at 5d.	0	7	6
Laying water-course and levelling 18½ roods, at 2s.	1	17	0
Two horses one day carting 30 yards of stone to drains	0	6	0
	<hr/>		
	£17	6	0
	<hr/>		
Cost per acre	£2	13	0

No. 19.—5A. 1R. 10P.—2221 yards. This is old meadow land; has a good surface; previous to draining was very wet, and of little value: the substratum varies, some part clay loam, and other parts clay mixed with stone. The drains are 30 feet apart.

Cutting open, breaking stones, laying drains, filling 2221			
yards, at 1d.	£9	5	1
Getting 138 yards of stone, at 5d.	2	17	6
Four horses 3 days carrying stone to drains, at 12s.	1	16	0
Filling into carts, at 1½d. per yard	0	14	6
	<hr/>		
	£14	13	1
	<hr/>		
Cost per acre	£2	16	0

No. 20.—5A. 0R. 26P.—2632 yards. The surface of this field is pretty even; it is old meadow, and varies much in the substratum. The surface was very wet previous to draining; now very much improved. The drains are 24 feet apart.

Cutting open, breaking stones, laying drains, filling in, at

1d. per yard	£10 19 4
Getting 160 yards of stone, at 5d.	3 6 8
Four horses 3 days carrying stone to drains, at 12s.	1 16 0
Filling 160 yards of stone into carts, at 1½d.	0 16 8
	<hr/>
	£16 18 8

Cost per acre	3 7 8
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Soughs laid in various ditches to convey water under, varying from 6 to 12 inches square:—

222 yards, or 27¾ roods, at 3s. per rood, for opening, walling, and filling in	£4 3 3
496 yards, or 62 roods, at 2s. 6d., as before	7 15 6
832 ditto, 104 ditto 2s.	10 4 0
270 ditto of stone for the above, at 5d.	5 12 6
Four horses 9 days carrying stone to the soughs, at 12s.	5 8 0
Filling 270 yards of stone, at 1½d.	1 8 0
	<hr/>
	£34 11 3

ABSTRACT.

	A.	R.	P.	YARDS.	£.	s.	d.
To No. 12, inclusive	113	3	10	83,090	718	4	11
„ 13,	14	2	0	9,038	68	6	7
„ 14,	3	2	8	1,764	10	13	8
„ 15,	11	2	12	9,696	56	13	0
„ 16,	6	0	4	3,536	20	0	10
„ 17,	4	3	25	2,956	16	14	10
„ 18,	6	2	0	3,024	17	6	0
„ 19,	5	1	10	2,221	14	13	0
„ 20,	5	0	26	2,632	16	18	8
To soughs, drains, &c. . . . .	..			1,550	34	11	3
Totals	171	1	55	119,507	974	2	9

ABSTRACT of the separate EXPENSES.

	£.	s.	d.
171A. 1R. 15P. drained and getting the stone—119,507 yards, or 68 miles 3 furlongs and 9 yards	720	7	3
Average expense per acre 4l. 4s. 2d.			
128A. 1R. 10P., part of the above, subsoil-ploughed	134	8	0
Carting Stones to Drains	119	7	6
	<hr/>		
	971	2	9

Average of the whole per acre, nearly, 5l. 14s.

The expenditure upon the farm since the occupation is as shown in the following table; but the charge for subsoil ploughing and carting stone to drains ought not to be added to the expenditure, as stated above, because that expense is included in the working of the farm, and all team-labour hired for lugging lime and working land is charged in the farm expenses.

STATEMENT OF EXPENDITURE upon the POLES FARM, from Lady-day, 1836, to 31st October, 1843.

Heads of Expenditure.	1836.	1837.	1838.	1839.	1840.	1841.	1842.	1843.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Labourers' wages	77 1 8	144 3 0	181 19 5	219 2 5	204 3 9	258 11 8	257 3 1	219 15 10
Manure, lime, & bones	63 14 0	109 4 6	77 7 6	42 1 0	87 16 7	24 8 0	210 16 2	56 13 6
Seed wheat, barley, and turnip seed	16 0 0	5 5 0	21 0 0	32 15 6	14 11 6	30 0 0	17 10 0	22 10 0
Clover seeds	19 7 2	25 0 0	15 8 0	17 15 7	14 17 8	23 5 5	23 16 8	23 8 7
Repairs to implements	3 15 10	20 9 5	5 12 9	3 11 10	4 2 9	43 2 8	10 18 1	15 18 9
Blacksmith	10 10 1	18 2 5	19 4 9	15 7 3	17 14 9	27 1 1	18 14 7	19 3 9
Saddler	11 13 8	11 4 3	10 6 2	5 2 10	17 8 9	3 7 1	4 10 7	1 12 11
Irrigating meadows . . . . .	..	18 19 7	10 17 0	10 6 0	15 9 0	..	30 10 0	1 4 8
Hauling lime and team labour . .	..	97 10 0	57 6 0	27 14 6	9 4 7	..	8 1 0	51 1 3
Poor and church rates	17 14 2	21 7 3	10 5 0	15 7 6	15 7 6	15 7 6	17 18 7	12 16 3
Taxes . . . . .	..	1 1 0	1 1 0	1 1 0	1 2 0	1 3 2	5 12 7	8 6 8
Tithe	31 7 0	31 7 0	31 7 0	31 7 0	32 7 0	32 7 0	32 7 0	32 7 0
Maltandhops . . .	..	..	..	21 3 4	..	23 13 6	10 9 4	13 2 4
Sundries	4 4 0	1 14 6	2 6 0	11 14 3	14 2 7	7 18 8	10 16 0	1 1 0
	255 7 7	505 7 11	444 0 7	454 10 0	448 8 5	490 5 9	648 16 8	484 2 6

Having shown the expenditure, I shall now give you an account of the produce in imperial bushels in the years 1822, 1825, and 1828. The quantities I have taken from the tithe, having been employed to value them in those years. Subsequently, from 1836 to 1843, the number of bushels per acre (both those years inclusive) has been taken from actual produce, which shows a great increase.

Description of Crop.	Number of Bushels per Acre, Imperial Measure.										
	1822.	1825.	1828.	1836.	1837.	1838.	1839.	1840.	1841.	1842.	1843
Wheat . .	12½	17	12½	16½	20½	18½	15½	20½	26½	28½	21
Barley . .	11½	none	12½	none	31½	33½	26½	40½	33	42½	38
Oats . . .	19	22½	16½	21½	29	33	44	41	42½	44	53

I am anxious to give a statement of the profit and loss upon the whole farm, but I find it a difficult matter, owing to the constant change of stock between the farm and demesne; however, I have made the following statement to the best of my judgment, taking the average upon the whole for the five preceding years to 31st of October, 1843 :—

Dr., the Farm.

31st October, 1843.	£.	s.	d.
To one year's Rent of Farm	212	0	0
To Expenditure for Wages, Tithe, Manure, and all other disbursements for one year	503	12	4
To Oats for 8 Horses, 30 weeks, 1 bushel each per week, at 3s. 6d.	42	0	0
To one year's Interest upon 720 <i>l.</i> , expended in draining	36	0	0
To ditto on Capital of 900 <i>l.</i>	45	0	0
To Seed-grain, not included in the expenditure	30	10	6
	869	2	10
By balance	18	9	8
	887	12	6

Cr., the Farm.

	£.	s.	d.
By value of Wheat, Barley, and Oats, one year	367	2	6
By keep of 40 head of Cattle in pasture, turnips, hay, and straw, one year, at 2s. 6d. a-head per week	260	0	0
By keep of 220 Sheep upon clover and turnips, one year, at 3d. per head	143	0	0
By Wool from 220 Sheep, at 2s. 6d.	27	10	0
By Breeding and Rearing 20 Pigs	30	0	0
By 12 tons of Bones on hand, charged in 1842 in the gross at 5 <i>l.</i> per ton	60	0	0
	887	12	6

Having given an account in detail of the quantity of draining done up to this time, I beg leave to state that the system set out upon has been strictly adhered to in the execution of the drains, of which I gave a section in my first report to you (vol. i. p. 34). The only variation is, that where there is a strong clay I prefer ramming it upon the stones to any other material, as no water should be suffered to go from the top of a drain. There are many opinions as to the mode and kind of drains, as well as the material to be used; but having suitable stone upon the farm, I think no better drain can be put in: it is effectual and permanent; the same parallel lines are kept in putting out the drains,

as well as the distance apart, suitable to the nature and kind of strata, as the variety of soil requires.

All ditches are now soughed, and there is no loss of ground; and to the extent now completed there is no failure.

The subsoil plough has been worked with great care to its full depth of 15 inches, over all the arable land that has hitherto come in course. From the commencement of the subsoil ploughing, and after one course of tillage, deep ploughing has followed—the first time from 9 to 12 inches; and the land now in turnips, being the second course, was ploughed last January from 14 to 15 inches, so that the full depth of soil is brought gradually into action, with the most beneficial result, not only as to great increased produce, but eradicating all weeds: of this I can speak with great satisfaction; remarks to this effect have been particularly made by gentlemen visiting the farm. The increased produce will show the good effect of such cultivation—the whole of the arable land is now cultivated for turnips in the four and five course system. Previous to your taking the farm in hand, little clover or turnips were grown, and nearly all the arable land summer-fallowed in the course. The turnips and clover have been very successful, and the whole is now cultivated upon a flat surface, without furrow or gutter. Great advantage is obtained by the deep ploughing succeeding the subsoil plough; by doing it gradually it gives a depth of soil for the crop to work in. The produce of turnips and clover has been the means of maintaining a large flock of sheep, which has very much aided the improvement of the arable land, as from one-half to two-thirds of the turnips are consumed on the ground. The sheep have done exceedingly well, and not an instance of one rotten. The other part of the turnips are consumed in the fold-yard and stalls to feed cattle and young stock.

The manure hitherto made use of has been 1 hogshead of Poitevin's disinfected, bones, street-sweepings from Ludlow, lime, and fold-yard manure: the above manures were used in an experiment for turnips and barley, 1841 and 1842 (see *Journal*, vol. iv. p. 117); clover, 1843, which was mown, produce estimated at 30 cwt. per acre; there was not the least difference visible in the crop. The field was sown with red clover, 6 lbs. to the acre; white Dutch, 8 lbs.; and 1 peck of rye-grass. The red clover failed throughout the field, the white Dutch and rye-grass were very good, and the different manures did not make any variation. Bones are continued to be used for turnips, at the rate of half a ton to an acre upon part of the turnip crop, and the effect has been very satisfactory throughout the course.

The crops this year (1844) are light, owing to the long drought, the wheat short in the straw, but will yield well; some of the barley did not vegetate till the rain we had the beginning of July;

the turnips also lay dormant, and when they did come the progress was slow for some time, and in consequence are small, with some failure from wireworm, slug, &c.

Having now gone through the detail of the arable land, I have a few observations to make upon the old coarse, uneven pasture; viz., to break up nearly the whole, thorough drain, subsoil plough, and take such course of tillage as may be deemed most applicable for restoring such fields again to permanent grass. I will commence with No. 13. Lime has been liberally applied upon the turf, after draining, during the summer previous to breaking up, and a strong crop of oats has been obtained: it will be desirable to get this field to permanent grass again as soon as possible, being so near to the homestead; and I intend taking such crops as may be most suitable to effect that object. No. 15, now oats, has been treated in the same manner, and is also intended for permanent pasture: considering the drougthy summer, the oats are good; I estimate the quantity at 30 bushels per acre. There are other pastures which are intended to undergo a similar process for their improvement. The meadows which have been irrigated are much improved, although the command of water is confined to flushes during a wet season; to the other meadows, considerable advantage has been derived from draining and top-dressing: altogether, the meadow-land has a good even surface, and, when all the draining is completed, the produce will be abundant. A pool by the fold is frequently loosed to go over a meadow below, through which all the soakings of the whole homestead are conveyed over; but at all other times the soakings are collected outside the fold, and put on soil brought together from various parts of the farm, which is added as occasion may require, making a quantity of rich compost. The soil is first put in an oblong heap of such dimensions as may be necessary, and the soakings of the homestead put over it, adding soil as it may be required, keeping the middle lowest; a tank is about being made for this purpose.

The fences have been straightened, and new lines made; there is yet a good deal to be done in making further new lines with quick.

The roads through the farm are made very good, which eases the hauling of grain and manure; the latter is now carted out with single horses, where three were formerly used.

I have the honour to be,

Sir,

Your faithful and humble servant,

RICHARD WHITE.

MISCELLANEOUS COMMUNICATIONS AND NOTICES.

I.—*Stall Feeding.*—*Some Experiments carried on in the Farm-Yard at Belmont, in Cheshire, in the Winter 1844-1845.* By JAMES H. LEIGH.

At the request of several of my friends I have been induced to send the following experiments to the Journal of the Royal Agricultural Society, not as containing anything new, but in the hopes of giving some encouragement to my brother farmers to try fresh experiments, and to show that stall-feeding may be carried on at a much lighter expense than is usually supposed. No credit is due to me for the selection of the beasts—many were turned off dairy cows, which, not being in calf, were useless there; the Scots were the remainder of a lot from which I had been killing all the summer and autumn; and the Welsh bullocks I bought when shooting in Wales early in September last. The Durham bullocks were a very fine set of beasts, four and five years old, and purchased in May; but I had scarcely got them home before they were attacked with the murrain, which they got well through, although it impeded their progress at grass. They would have paid me well to have kept two or three weeks longer, but the case of pleuropneumonia occurring, frightened me, and I sold as soon as I could get the requisite notices prepared. The butchers were satisfied with their bargains; and, to use their own expressions, they said “they died well.” The cows would have consumed much more hay if it had been given to them; but I do not think it would have been of advantage, as they would have left their cut stuff, or only picked the oil-cake out of it. The bullocks were perfectly satisfied, and upon the whole did well, the last lot particularly, as well as the heifers—the only complaint being that the butchers said they had given full 6*d.* a pound.

On the 11th of November, 1844, I commenced feeding the first lot of beasts in the stalls regularly, having had them put up at night for ten or twelve days previously; they consisted of eighteen Durham bullocks four and five years old, and ten cows of the short-horn breed which were barren and turned off from my dairy stock. I had them weighed on the above-mentioned day, and each succeeding Monday, until the day of sale. (See Table, No. 1.)

They were fed four times in a day in the manner following:—The first thing in a morning cut oat-straw, with oil-cake and barley-meal; and again at noon with the same food; at two o'clock 20 lbs. of Swedish turnips; and at night the morning feed was repeated, and about 2 lbs. of hay in the rack. They were turned out to water every morning about eleven o'clock. I purchased the oil-cake in Liverpool at 8*l.* the ton. The barley-meal cost me as near as possible, with expenses, 1*d.* per lb. The turnips, hay, and oat-straw were grown on my own farm; I therefore estimate the cost at the average selling price in the neighbourhood.

TABLE, No. 1.

No.	1844.										1845.		
	11 Nov.	18 Nov.	25 Nov.	2 Dec.	9 Dec.	16 Dec.	23 Dec.	30 Dec.	6 Jan.	13 Jan.			
1.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.			
2.	13 3 8	13 3 16	14 2 0	14 3 2	14 3 20	15 0 0	15 1 0	15 2 0	15 2 18	15 3 2			
3.	12 1 3	12 1 10	13 0 0	13 1 0	13 2 0	13 2 12	13 3 4	13 3 4	14 0 20	14 1 13			
4.	12 0 0	12 0 8	12 2 20	13 0 3	13 1 0	13 1 16	13 2 9	13 2 22	13 3 18	14 0 10			
5.	12 1 0	11 1 2	12 2 0	12 0 0	12 1 0	12 1 18	12 2 11	12 3 0	12 3 18	13 0 12			
6.	12 0 0	12 1 2	12 2 10	12 3 2	13 0 0	13 0 14	13 1 2	13 1 21	13 2 11	13 3 5			
7.	12 3 0	12 3 6	12 3 18	13 1 0	13 2 15	13 2 24	13 3 16	14 0 5	14 0 25	14 1 20			
8.	11 3 0	11 3 7	12 1 0	12 3 0	13 0 12	13 0 12	13 1 3	13 1 22	13 2 19	13 3 13			
9.	12 1 15	12 1 20	12 3 10	13 0 15	13 2 8	13 3 0	14 0 0	14 0 18	14 1 19	14 2 13			
10.	11 3 0	11 3 6	12 1 4	12 2 0	12 3 4	12 3 17	13 0 7	13 1 0	13 1 20	13 2 14			
11.	11 0 18	11 0 26	11 2 8	12 2 23	11 3 20	12 0 16	12 1 6	12 1 24	12 2 18	12 3 11			
12.	10 2 23	10 3 2	10 3 15	11 0 6	11 0 20	11 0 6	11 2 1	11 2 20	11 3 10	12 0 3			
13.	10 3 15	10 3 22	11 1 10	11 2 4	11 3 1	11 3 14	12 0 6	12 1 0	13 2 0	13 2 21			
14.	11 3 1	11 3 8	12 1 20	12 2 0	12 1 6	12 0 2	12 2 21	12 3 11	13 0 1	13 0 22			
15.	11 2 20	11 3 0	12 0 20	12 1 0	12 1 6	12 1 12	12 2 4	12 2 21	12 3 10	13 0 5			
16.	11 3 18	12 3 24	13 0 8	13 2 0	13 3 3	13 0 15	14 0 5	14 0 24	14 1 20	14 2 16			
17.	11 0 0	11 0 8	11 2 0	11 2 20	12 0 6	12 0 6	12 2 0	12 2 18	12 3 7	12 3 26			
18.	11 1 0	11 1 8	11 1 18	11 2 4	11 2 20	11 3 4	11 3 24	12 0 16	12 1 7	12 2 3			
19.	10 0 20	10 1 0	10 3 0	11 1 0	11 1 20	11 2 1	11 2 24	11 3 17	12 0 10	12 1 1			
20.	10 0 1	10 1 6	10 2 0	10 2 20	11 0 6	11 2 1	11 1 22	11 2 10	11 3 0	11 3 21			
21.	11 1 20	11 1 24	11 2 15	12 1 20	12 2 6	12 2 22	12 3 19	13 0 12	13 1 3	13 1 25			
22.	9 3 4	9 3 9	10 0 0	10 0 12	10 1 0	10 1 8	10 2 3	10 2 18	10 3 7	11 0 0			
23.	9 2 0	9 2 6	10 0 0	10 3 0	11 1 0	11 2 0	11 2 18	11 3 9	11 3 27	12 0 22			
24.	10 2 0	10 2 5	10 3 0	10 3 20	11 0 6	11 1 0	11 1 18	11 2 17	11 3 9	11 1 0			
25.	9 3 0	9 3 4	10 1 1	10 2 2	10 3 7	11 0 0	11 0 20	11 1 10	11 2 0	11 2 21			
26.	9 3 1	9 3 5	10 0 10	10 1 10	10 2 4	10 2 14	10 3 2	10 3 20	10 3 16	11 1 0			
27.	9 3 0	9 3 3	10 0 0	10 0 20	10 1 6	10 1 16	10 2 5	10 2 22	10 3 16	12 0 8			
28.	9 2 0	9 2 14	10 0 0	10 0 20	10 1 6	10 1 17	10 2 12	10 3 1	10 3 19	11 0 10			
	313 1 17	315 0 27	324 2 21	333 3 2	339 1 4	342 2 14	348 1 2	353 0 4	345 2 5	350 3 9			

Durham Bulls

Cows

The following table shows the quantity of food given daily to each beast, and the weekly cost:—

	<i>s.</i>	<i>d.</i>
4 lbs. of oil-cake each per day, at 8 <i>l.</i> per ton . . .	2	0
4 lbs. of barley-meal per day, at 1 <i>d.</i> per lb. . .	2	4
10 lbs. of cut oat-straw per day, at 2 <i>s.</i> the cwt. . .	1	3
20 lbs. of turnips, at 20 <i>s.</i> the ton . . .	1	3
2 lbs. of hay at night, at 4 <i>l.</i> the ton . . .	0	6
Weekly cost . . .	7	4

I continued this manner and quantity of feeding until the 16th of December, when I found they were not increasing so much in weight as they had done; I therefore ordered a bushel and a half of potatoes, or 135 lbs., to be steamed and given amongst the cut stuff daily to the twenty-eight beasts, as well as a pound of Indian corn ground fine for each of the beasts, making it into a thick gruel, and given with the potatoes, oil-cake, and cut stuff. The price of the potatoes was 1*s.* 6*d.* for 90 lbs., consequently the extra weekly cost of each beast would be, for potatoes 7*d.*, and the Indian corn at 1*d.* per lb. 7*d.* also, making the weekly cost 8*s.* 6*d.* each, until the last week, when they had 2 lbs. each of oil-cake more daily, which increased the cost 1*s.* a-week—in the whole 9*s.* 6*d.*

It will be observed by reference to the Table of Weights, that No. 12 does not appear in the list after the 30th of December—he had been going on remarkably well, and gained more in weight the last week than any except 2 or 3. On the 31st of December, however, he refused his food; I had him removed from the stock and bled, and immediately sent for the veterinary surgeon, who at once pronounced it pleuropneumonia, and applied the usual remedies, but without success; it rallied so far as to feed a little, but died on the 2nd of January. I had the feeding houses sprinkled twice a-day with the chloride of lime, and very fortunately had no other cases, although some of the cattle remained with me after the 17th of January, the day of my first sale. The average weight gained by the twenty-seven beasts in nine weeks was 200 lbs. and $\frac{1}{2}$, at a cost of 3*l.* 11*s.* 8*d.*—being five weeks at 7*s.* 4*d.*, three weeks at 8*s.* 6*d.*, and one week 9*s.* 6*d.* I ought to mention that they had the last three weeks bean instead of barley-meal.

When the several butchers had removed their purchases, I had all the buildings whitewashed and plentifully sprinkled with chloride of lime and water before putting up another lot of beasts, consisting of 16 Scots and Welsh bullocks, 1 Durham ox, 1 long-horn heifer of Lord Bagot's celebrated breed, which was barren, and 12 cows and heifers. The bullocks had been kept in the fields with a shed to go in, and were supplied with oat-straw and a few turnips; the cows were with my dairy stock, and had little more than oat-straw. The regular feeding was commenced on the 3rd of February, but in consequence of the severe frost the yard was too slippery to weigh the cattle for the first time before the 5th of February; they were not weighed again until the 17th, and afterwards on each succeeding Monday, until the day of sale. (See Table, No. 2.)

TABLE, No. 2.

1845.

No.	5 Feb.	17 Feb.	24 Feb.	3 March.	10 March.	17 March.	24 March.	31 March.	7 April.	14 April.	21 April.
1.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.	Cwts. qrs. lbs.
2.	8 2 0	9 2 0	10 0 0	10 3 4	11 0 6	11 1 4	11 1 25	11 2 16	11 3 6	11 3 26	12 0 19
3.	8 0 3	9 1 4	9 1 4	9 2 14	9 3 16	10 0 10	10 1 1	10 1 19	10 2 8	10 2 26	10 3 16
4.	8 2 0	9 1 10	9 3 16	10 0 20	10 2 2	10 3 3	10 3 19	11 0 4	11 1 0	11 1 19	11 2 9
5.	8 3 0	9 1 6	10 0 0	10 1 10	10 2 10	10 3 0	10 3 20	11 0 11	11 1 0	11 1 18	11 2 15
6.	8 1 2	9 0 0	9 2 0	9 3 2	9 3 25	10 0 8	10 2 25	10 3 16	11 0 6	11 0 25	11 1 16
7.	8 1 5	9 0 4	9 2 10	10 0 0	10 1 10	10 2 0	12 2 20	12 3 0	13 0 9	13 1 0	13 1 21
8.	11 1 0	11 2 10	11 3 11	12 0 10	12 1 3	12 2 0	8 2 17	8 3 5	8 3 21	9 0 0	9 0 16
9.	6 3 0	7 1 6	7 3 10	8 0 6	8 1 2	8 1 26	9 3 18	10 0 7	10 0 23	10 1 12	10 2 2
10.	7 3 0	8 1 10	8 3 18	9 1 2	9 2 0	9 2 21	9 3 11	9 2 1	9 2 20	9 3 10	10 0 0
11.	7 2 0	7 3 15	8 1 26	8 2 25	8 3 25	9 1 10	9 3 12	10 0 3	10 0 21	10 1 12	10 2 2
12.	7 2 1	7 3 10	8 2 0	8 3 20	9 0 19	9 2 18	9 3 4	12 3 25	13 0 15	13 1 6	13 1 26
13.	7 2 6	8 0 22	8 2 23	9 0 15	9 1 16	12 2 10	12 3 4	12 3 25	13 0 15	13 1 6	13 1 26
14.	10 1 6	11 1 6	11 3 12	12 0 15	12 1 13	12 2 10	8 1 7	8 1 24	8 2 12	9 3 1	8 3 19
15.	6 2 0	6 3 20	7 1 24	7 2 25	7 3 22	8 0 16	8 2 20	8 3 9	8 3 26	9 0 15	9 1 5
16.	6 3 0	7 1 10	7 3 11	8 0 10	8 1 8	8 2 0	8 2 20	8 3 10	8 3 27	9 0 16	9 1 6
17.	6 3 7	7 1 2	7 3 10	8 0 10	8 1 7	8 2 0	8 2 20	8 3 10	8 3 26	9 0 16	9 1 6
18.	6 1 3	6 2 23	7 0 16	7 1 9	7 2 8	8 0 17	7 3 20	8 0 9	8 0 25	8 1 13	8 2 2
19.	6 2 2	7 0 16	7 2 6	7 3 4	7 3 25	8 0 27	8 1 8	1 26	8 2 16	8 3 5	8 3 23
20.	6 2 7	7 1 6	7 2 10	7 3 11	8 0 8	8 1 0	8 1 21	8 2 10	8 3 0	8 3 17	9 0 7
21.	6 3 0	7 0 10	7 1 20	7 2 19	7 3 10	8 0 1	8 0 20	8 1 10	8 2 1	8 2 10	8 3 10
22.	7 2 0	8 1 12	8 3 11	9 0 19	9 1 26	9 2 20	9 3 11	10 0 2	10 0 21	10 1 10	10 2 1
23.	7 3 0	8 1 2	8 3 11	9 0 0	9 0 22	9 1 18	9 2 10	9 3 0	9 3 18	10 0 8	10 1 1
24.	6 2 3	7 1 0	7 2 20	7 3 20	8 0 16	8 1 8	8 2 0	8 2 19	8 3 10	9 0 0	9 0 19
25.	8 2 3	9 0 23	9 2 4	9 3 2	9 3 23	10 0 19	10 1 10	10 2 0	10 2 17	10 3 7	10 3 27
26.	8 1 4	9 0 8	9 1 12	9 2 2	10 0 1	10 0 22	10 1 15	10 2 4	10 2 22	10 3 11	11 0 2
27.	8 2 0	9 1 0	9 2 6	9 3 7	10 0 6	10 1 0	10 1 21	10 2 12	10 3 2	16 3 20	11 0 12
28.	8 2 8	9 3 5	10 0 10	10 1 20	10 2 21	10 3 14	11 0 7	11 1 0	11 1 18	11 2 9	11 3 2
29.	8 2 0	9 0 10	9 1 13	9 2 20	9 3 18	10 0 10	10 1 3	10 1 24	10 2 14	10 3 4	11 3 24
30.	8 3 0	9 2 12	9 3 22	10 1 0	10 2 2	10 2 20	10 3 12	11 0 6	11 0 25	11 1 16	11 2 9
	284 0 2	253 2 2	267 0 21	276 1 21	283 2 20	289 1 24	294 3 11	299 3 5	304 2 12	309 1 7	315 1 13

NOTE.—W. for Welsh, Sc. for Scots bullocks.

They were fed four times a-day in a similar manner to the last lot, but there was some difference in the price of oil-cake and oat-straw, consequently the weekly cost varied a little, as appears by the following account:—

	s.	d.
4 lbs. of oil-cake each daily, at 9 <i>l.</i> per ton	2	3
4 lbs. of bean-meal each daily, at 1 <i>d.</i> per lb.	2	4
10 lbs. of cut oat-straw, at 2 <i>s.</i> 6 <i>d.</i> the cwt.	1	5½
20 lbs. of turnips or beet, at 20 <i>s.</i> per ton	1	3
Weekly cost for each	7	3½

On the 17th of February they had 2 lbs. of hay for each beast in the rack at night, which added 6*d.* to the weekly expense. I continued this kind and quantity of food until March 10th, when they commenced with 1 lb. of Indian corn each, made into gruel and mixed with the cut stuff. Having finished my bean-meal on the 24th of March, and the duty being lowered on sugar, I purchased some a little damaged at 2*d.* the lb., and treacle at the same price—the latter I preferred, being easily dissolved in water and mixed with the cut stuff. Red wheat was only selling here, good samples, at 6*s.* the 70 lbs.; I had some of mine therefore only once winnowed and crushed, and gave 4 lbs. to each beast instead of the bean-meal, and ¼ of a lb. of treacle to each daily cost 3½*d.* weekly. On the 14th of April I discontinued the treacle and sugar, and gave 1 lb. of oil-cake and 1 lb. of crushed wheat extra to each beast. On the 21st of April they were weighed for the last time, when it appears from reference to Tables 3 and 4, that the average gain of each beast was 303¼ lbs., at a cost of 4*l.* 8*s.* 1½*d.* each in ten weeks and five days.

TABLE, No. 3.

	£.	s.	d.
12 days, at 7 <i>s.</i> 3½ <i>d.</i> the week	0	12	6
3 weeks, at 7 <i>s.</i> 9½ <i>d.</i> „	1	3	4½
2 weeks, at 8 <i>s.</i> 4½ <i>d.</i> „	0	16	9
3 weeks, at 8 <i>s.</i> 8 <i>d.</i> „	1	6	0
1 week, at 9 <i>s.</i> 9½ <i>d.</i> „	0	9	6
Total	£4	8	1½

TABLE, No. 4.

Thirty beasts gained from Feb. 5 to Feb. 17, 12 days	2184 lbs.
„ „ Feb. 17 to Feb. 24, 7 days	1531
„ „ Feb. 24 to March 3, 7 days	1036
„ „ March 3 to March 10, 7 days	811
„ „ March 10 to March 17, 7 days	648
„ „ March 17 to March 24, 7 days	603
„ „ March 24 to March 31, 7 days	554
„ „ March 31 to April 7, 7 days	539
„ „ April 7 to April 14, 7 days	527
„ „ April 14 to April 21, 7 days	566
Total	9111 lbs.

They had mangold-wurzel the last month; and I think it would have been of advantage, had my turnip crops not failed or nearly so, if I could have given 40 lbs. daily, instead of 20 lbs. I tried at one time crushed linseed for gruel instead of Indian corn, but with oil-cake it acted too much as an aperient. They had a lump of rock-salt in their manger to lick when they pleased, and I occasionally had their food sprinkled with common salt.

Mr. C. Hillyard, in his valuable work on practical farming and grazing, says:—"Beasts should increase in the first month, 64 lbs.; second month, 80 lbs.; and the last fortnight, 48 lbs.; in the ten weeks, 192 lbs." Mine did more; I therefore presume they did well, but I confess I was rather disappointed at the effect of the sugar and wheat.

Belmont, May 21, 1845.

II.—*Experiments on the Shed Feeding of Sheep.* By the Rev. A. HUXTABLE.

To J. W. Childers, Esq., M.P.

DEAR SIR,—I beg at length to submit to you the details of my experiments in shed feeding sheep, which were suggested by your own, as described in the early numbers of the Society's Journal. The particular measures which I adopted were designed to remedy the serious inconvenience of foot-lameness in the sheep, which was found to arise from confining the animal to one small spot.

Having observed that sheep in wet weather on our downs always select the most beaten roads for their bed, it occurred to me that not only when under sheds should they lie on boards, according to your own experiment, but also that the courts to which they have daily access whilst their houses are being cleaned should be covered, not with soft litter, but with hard chalk or sand, or other materials to form a solid bottom. My little yards attached to the sheds are floored with a sort of asphalt made of chalk beaten small, covered with gas-tar and sand. In constructing sheds for my sheep I have kept in view the strictest economy; and I venture to send these minute details, which I hope will serve to prove that the protection of sheep from the inclemency of the weather is within the reach of every tenant farmer. Each of these sheds contains about 50 sheep. They are erected on a very simple plan:—A couple of fir poles, 12 feet long, are nailed together at the top; their extremities, at a distance of 15 feet, are driven into the ground; another couple, 10 feet distant, are united with this, and held firm by a ridge-pole nailed into and lying between the tops of the fir poles. Side pieces are nailed parallel to the ridge-pole, and small hazel-wood is interlaced so as to support the thatch, which a labourer ties on with tar-twine. The thatch in front and behind reaches to about 3 feet from the ground; behind, a bank of turf is raised to meet the thatch; the front is guarded by a hurdle, moveable at pleasure, to allow the sheep to go into the court,

which is of the same size as the shed. It is important that both ends of the shed should be protected with bays only, which will secure a free ventilation, yet keep out rain. My sheds, about 50 feet long (not charging the straw), cost about 41s. each.

These sheds are covered with 1-inch boards, separated (each strip from the other) by $\frac{1}{2}$ -inch intervals. The cost of the timber and mode of preparing the floor were as follows:—White pine timber was used for its cheapness, being 1s. 3d. the cube foot, which would therefore give eleven 1-inch boards. On account of the particular width of the logs which I bought, the board was sawn into pieces 7 inches broad and 1 inch thick. These, for economy, are hand-sawn into three parts, and are nailed upon joists at a distance of $\frac{1}{2}$ -inch. By this plan nearly one-third of timber is saved: so that each sheep, requiring 9 feet of space, lies actually on 6 feet of 1-inch board. The cost of timber for joists, nails, and carpenters' work, raises the total expense of placing the sheep on boards to 1s. 4d. per head. Instead of sleepers I used small blocks, 6 inches thick, to keep the rafters from direct contact with the manure. The boards are put together into frames about 10 feet by 4, so that they may easily be taken up by one man. Beneath the boards the floor, excavated 8 or 9 inches, is puddled and made water-tight, and covered with 6 inches of sawdust, burnt clay, or good dry mould. This receives and absorbs the manure which falls, or is swept below twice a-day. The boards, after sweeping, are watered with a solution of 3 lbs. of sulphate of iron, which instantaneously removes the odour not only of the ammonia, but of the more offensive sulphuretted hydrogen. The boards should be laid perfectly flat, to prevent the sheep slipping about. The sheep are fed under the sheds, not in the courts. The results of this arrangement have been most successful, both in the health and *well-doing* of the sheep.

It is true that I have lost four head, which seem to have died from apoplexy; but I lost the same number in the flock which were at large, and treated in the usual manner. Though I have had more than 300 Southdowns so shedded, some of them longer than five months, yet I have never seen any instance of lameness, even in the least degree.

Their food consists of turnips, for the last fortnight only of swedes; half a pint per day (never more) of oats or peas; with straw cut into chaff, over which ground linseed has been poured, mixed with boiling water.

I regret that I cannot send the important statistics of weight and improvement under this regimen. During one month the sheep were weighed, and found to have increased about 3 lbs. per week on an average; that is, ten were selected and weighed which seemed fairly to represent the flock, and they had made this improvement. The illness of my bailiff stopped these calculations; but the general issue will be allowed to be satisfactory, as more than half have been sold which in twelve weeks have paid 13s. a-head.

Leaving out of the account both the injury which in bad seasons my clay-lands would have sustained by the treading of the sheep, and the value of the rich manure saved under shelter (its gases fixed by the

sulphate of iron and gypsum strewed daily over the boards), I consider that the whole expense of boards and sheds was saved in the first month. The same boards will last at least one season more, and if better timber had been used, for a much longer period.

I am, dear Sir,
Yours faithfully,
A. HUXTABLE.

Sutton Waldron Rectory, Shaftesbury,
March 11, 1845.

III.—*On the Use of Sulphuric Acid with Bones as Compost.* By P. DAVIS.

WITH reference to Mr. Pusey's suggestion as to the propriety of using bone-dust (dissolved in sulphuric acid) along with *compost* instead of *water* for turnips, I can confirm his idea from practice, having last year manured 5 acres with only 13 bushels of bone-dust dissolved in 270 lbs. of sulphuric acid and 150 gallons of water. After standing twenty-four hours, the liquid was mixed with 3 cart-loads of *coal-ashes*, and left to remain for a week, during which time it was turned over two or three times. The mixture was then drilled along with the seed, and the result was a fair crop of common turnips, off a piece of poor land, without other manure, and at the cost of only 12s. 9d. per acre.

Milton House, near Penbridge, Herefordshire,
April 25, 1845.

IV.—*Trials of Sulphuric Acid and Bones for Turnips.* By R. W. PURCHAS. 1845.

	T.	cwt.	lbs.
FIELD No. 1.—Soil, sandy loam upon old red sandstone, so completely worn out by the late tenant that a part without any manure, lying between the acre with acid and bones and the acre with dung, produced only, per acre	0	5	20
One acre, manured with 160 bushels of turf-ashes wetted with water	8	14	32
One acre, manured with 160 bushels of turf-ashes, 2 bushels of fine bone-dust, and 80 lbs. of brown acid (oil of vitriol), costing 12s.; the bones and acid dissolved and treated as below	14	5	68
One acre, manured with 20 yards of dung	14	11	68
This field was limed with 108 bushels of lime per acre in 1842.			

FIELD No. 2.—Soil, stone brash upon old red sandstone, limed in 1841.

	T.	cwt.	lbs.
One acre, manured with 15 bushels of coal-ashes and 15 bushels of charcoal-dust, drilled in with the seed, produced	4	8	64
One acre, manured with 80 lbs. of brown acid and 2 bushels of fine bone-dust dissolved, mixed with 500 gallons of water, and sprinkled with a water-cart over the land before ridging up; and 15 bushels of coal-ashes, and 15 bushels of charcoal-dust, drilled in with the seed	12	11	48

The swedes (Skirving's) were planted on the ridge, the first and second weeks in July, at 24 inches; the plants thinned to 9 inches; horse and hand hoed three times.

Pulled, topped, tailed, and weighed, 14th January, 1845.

I had the brown sulphuric acid, strength 1·750, at $\frac{3}{4}d.$ per lb., from that highly respectable manufacturer Mr. James Gibbs, Bristol; and the fine bone-dust, of excellent quality, from Messrs. H. and T. Proctor, Bristol, at 26s. per quarter.

The acid and bones for field No. 1 were treated as follows:—for 1 acre, an empty hogshead of about 100 gallons, with one head out, was used: 2 bushels (or 16 gallons) of bone-dust was put into the cask or tub, then 80 lbs. (or about $4\frac{1}{2}$ gallons) of acid, the mass being well stirred; to this was added 24 gallons of *boiling* water; the mixture being well stirred the whole time the water was being put in, to keep down the violent ebullition that ensued. In a few minutes the bone-dust was perfectly dissolved, and fit for use. The mixture was then taken in the tub into the field, put by the heap of turf-ashes, which being very dry, about 500 gallons of water were gradually added to the mixture, and thrown over the ashes; which, being well mixed, were then put into carts and distributed with a shovel into the drills, the ground ridged up, and immediately sown.

I put in about 3 acres per day, using three old hogsheads or tubs (worth about 5s. each); and, when taken to the field, two lots were put together, the empty tub being used to mix the proper quantity of water before throwing over the ashes.

A neighbouring farmer had one carboy of acid *last* year; he used *dried mud* from a horse-pond to mix with the acid and bones: and he is so satisfied with the result that he has ordered 10 carboys of acid *this* year. My friend says the acid and bones beat every other manure (guano, dung, &c.); and are the *cheapest* and best of all manures for growing turnips. The soil, a poor sand, was limed with 108 bushels per acre, immediately before the mixture was put on.

I am convinced that, without lime in the soil, acid and bones will not act; this I witnessed in a neighbour's field last year—the field six years ago was part of a common, it was then broken up, and part limed the following year. Last year the whole field was planted with turnips—using 2 bushels of bone-dust and 80 lbs. of acid per acre; put on as on

my field No. 2: the result was, the part limed produced a good crop for the season, beating 15 loads of dung; but the turnips on the part not limed, although coming up well, very soon died away, and in less than a month not a single plant was to be seen.

In the field No. 2, the acid and bones were treated as No. 1; when taken to the field in a water-cask holding 250 gallons of water (twice filled), was used with half the quantity of the mixture, and sprinkled over the land before being ridged up; the ashes were then drilled in with the seed.

His Grace the Duke of Richmond's plan of running the mixture and water *along the drills, after ridging*, is a much better plan than the above; and which, for the future, I shall adopt when using the mixture in a liquid state.

In every trial of acid and bones the turnips came into rough leaf a week before those planted the same day with other manures.

Pilstone, near Chepstow,

May 21, 1845.

V.—Addition to Paper on Hedges, in the last Number. By

JOHN GRANT, Surveyor and Land Agent.

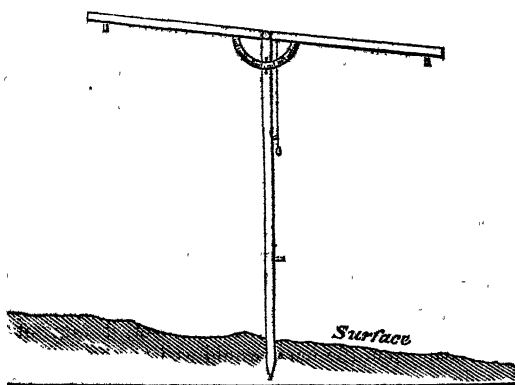
No man can be called a good husbandman who can quietly pass his lifetime cultivating land of which one acre in ten, or one in eight, is lost to himself and the community by hedges and waste. The following calculations of an estate in this neighbourhood prove that the loss by hedges stated in the table given in the last volume of the Journal was anything but exaggerated. Many other instances might be given, as unfortunately it is but the type of a very large class in the West of England, and there is an equally great loss over the whole parish in which this is situated. This estate contains 257a. 3r. 21p., of which only 220a. 2r. are cultivated as arable, pasture, and orchard; the remaining 37a. 1r. 15p. consisting of 9a. 8r. 18p. of roads, buildings, and plantations, and 28a. Or. 37p. of hedges and waste. The hedges in and bounding the estate are 14 miles long, and cover 11 per cent. of the whole; and there is rather more than 1 acre of hedge for every 8 acres of cultivated land. There are 97 numbers in the reference to the map, from which the size of the enclosures, after making allowance for houses and gardens, may be conceived. Among other evils attendant upon such small enclosures is the greater number of gates which are required. On this estate there are 120, to keep up and renew which, every farmer must know to be no small matter. The number of trees, chiefly ash and elm, is very great: they grow so closely together that not above one in ten can ever be expected to make a good tree. The hedge on the south side of the estate is for some distance more than 2 perches wide, whilst the parish roads in general do not average 1 perch. Of the 28a. Or. 37p. occupied by hedges, at least 20 might be saved, besides 3½ acres occupied by hedges which bound the estate, but do not belong

to it. Those who have ever had occasion to purchase a portion of land to add to their estates, can best conceive what would probably have to be given by the proprietor of this, if he wished to purchase 20 acres from an adjoining estate to add to this; probably not less than 2000*l*.

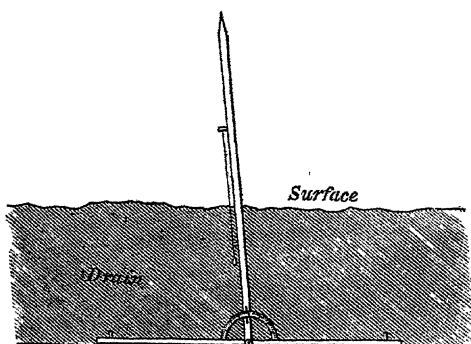
But the loss in space is not the only, nor even the greatest loss sustained in this case. There are 6 acres of meadow lying conveniently for drainage and irrigation, over which a person could not walk dry-shod in summer, saturated as they are with red and green stagnant water, and covered with cart-loads of rushes and other weeds. There are 50 acres more, which by being drained might be made to produce at least double what they do at present; and over a great part of the rest of the estate, by a moderate outlay, there would be an immense increase in the returns. The estate lies upon the red sandstone, and is in general of fair, some of it of superior quality; it has a good aspect, and lies well for being drained.

VI.—*Drain Level*.

THE idea of a "*Drain Level*" having suggested itself to me, which for efficacy and simplicity is worthy the attention of drainers generally, I have taken the liberty of enclosing a rough sketch, with a description of the implement, which consists of an upright leg, a cross piece connected to the upright at its centre, a screw-joint, a vernier-scale fixed to the cross piece and running in a slide on the upright, a sight attached to each extremity of and under the cross piece, and a plumb-line.



The instrument would be stuck in the ground, and a stick of the same height placed where the drain is required, the two sights would be brought to bear on the top of the stick, and the instrument locked in that position by the screw-joint, the scale would mark the inches of fall per yard.



By reversing the instrument, still locked, the workmen would use it in the bottom of the drain. When not in use the cross piece would be detached, and the whole carried about as easily as a shovel or other working tool.

SAML. H. C. PAYNE.

*Llanelly House, Carmarthenshire,
January 2, 1845.*

VII.—*On an Improvement in the Mode of Attaching Horses to Waggon.* By J. H. GRIEVE.

HAVING observed amongst the topics proposed by the Society as subjects for prize essays, that of the use of one-horse carts, I thought it might be agreeable to you to receive some remarks relative to different modes of traction which have been suggested to me by actual observation, and which, so far as my knowledge extends, have as yet passed almost without notice.

There is no mechanical reason why a single-horse cart should possess any advantage over a four-wheeled waggon; and if that opinion has gained ground in this country, it is wholly to be attributed to the defective manner of application of horse-power.

In one-horse carts a part of the load weighs upon the saddle placed behind the shoulders of the horse; and as the principal fulcrum upon which he acts is concentrated in his hind-feet, it may at first sight appear that the load upon the back would assist in the effort of traction, and I have no doubt that it does so to a certain degree; but this small advantage is only gained at the expense of the muscular power of the animal, and has a natural tendency to exhaust and fatigue him.

If the use of waggons has hitherto proved unsatisfactory, the cause is merely that no sufficient care has been taken to ensure the *simultaneous* effort of the horses, so that a great part of their power becomes inefficient.

Nothing indeed can be more opposed to reason and good sense than the manner of yoking several horses in tandem that is usually practised both for carts and waggon, particularly in the south of England.

In the first place the shafts are often too much elevated, and then the shaft-horse is borne to the ground by the efforts of those that precede him, or he is made to swerve from side to side by the alternate jolting of the wheels, or by the leaders varying from the straight line of traction.

In the case of four-wheeled waggon with horses yoked abreast, the traces of each horse are always fixed to the splinter-bar; it is more than difficult for the driver to ascertain if all his horses are exerting their strength together, and it is almost impossible for him, even with the utmost care, to force them to do so.

A much better method of yoking has been applied for ages past to the plough, viz., that of the swing-bar; but, strange to say, this system has not been adopted for carriages, with the exception of the leaders of stage-coaches; and this only proves that convenience, or we may say necessity, has been the primary cause of its being adopted at all, and not any sense of the superior mechanical arrangement of the system.

A little reflection will however show that this arrangement is better adapted than any other to produce simultaneous action, each horse being so placed respectively to his neighbour as to operate on a balance-beam, and it is self-evident that neither can draw unless the other acts as a counterpoise: the result is that the full and united force of the team is obtained for the purposes of traction.

For centuries past this system has been successfully applied in Belgium to the yoking of horses to four-wheeled waggon; and I could cite various instances of great loads conveyed in that manner, but will only mention a single instance of a load of goods which I myself saw weighed, and which was brought from Antwerp to the neighbourhood of Mons, a distance of about 72 miles. The waggon was a very heavy one, with the wheel-tires 8 inches in breadth, and was drawn by five horses, and the load weighed fully 14 tons. Now when we take into consideration that several considerable acclivities had to be surmounted, at only two of which spare horses had been used, this example alone is sufficient to demonstrate the evident superiority of this system of traction. Doubtless the paved roads offer less friction than our usual macadamized ones, but this advantage will not account for the marked superiority of this load, which amounts, including the weight of the waggon, to about $3\frac{1}{4}$ tons per horse.

I may observe that in Belgium the load is strictly limited by law in proportion to the breadth of the tires, and that a greater load than that above cited could not be conveyed during fresh weather; but instances have occurred of much heavier weights being drawn by the same number of horses, during hard frosts, when no injury can be done to the roads.

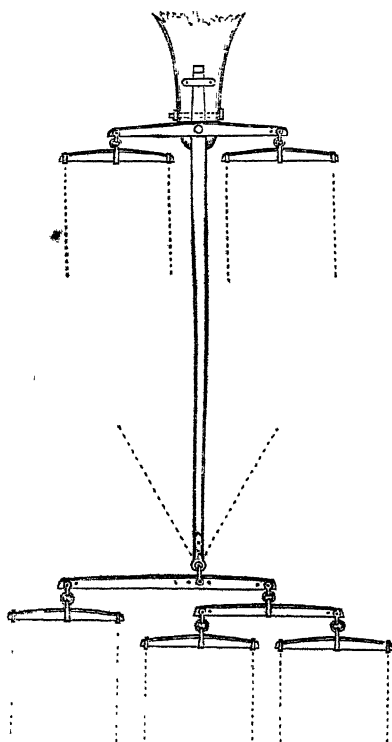
The horses usually employed on the road are of the old Flanders breed, the same as the common dray-horse in London, but evidently inferior to them in strength and weight.

Waggon of the same nature, but of a lighter construction, are also

generally employed for farm purposes, and are found convenient and effective.

The Belgian Government have applied the same principle to the yoking of the artillery-trains; and it is certain that no guns of the same weight, and drawn by the same number of horses, would otherwise be able to traverse rough and uneven ground with the same facility.

It may be remarked that provision is made to adjust the leverage to the power of each horse, so that the pairs may be always equally matched, if not in strength, at least in their effective efforts. To explain this more clearly, I have subjoined a diagram representing the fore-train of a waggon adapted for five horses. It will be observed that spare holes are provided in the swing-bars to change the leverage.



N.B. It is curious, but nevertheless the case, that the whole team of five horses is guided by a single small line tied to the middle of the bridle-reins of the off-hand leader.

3, *King's Road*, May 12, 1845.

XXII.—*On the Farming of Kent.* By GEORGE BUCKLAND,
Land-Agent.

PRIZE REPORT.

THE county of Kent occupies the south-east corner of England, and is admirably situated, in consequence of its maritime position, for the transit of its numerous productions—the Thames forming its northern boundary; the English Channel washing the whole line of its eastern shore; while the Medway and the Rother, the Stour and the Swale, afford excellent water communication to very extensive and fertile districts. The London and Dover Railway, passing down the valley lying beneath the green sandstone ridge, supplies a cheap and expeditious transit to those parts of the county which are far removed from water communication; and other lines, either projected or actually commenced, will open up every section of this important county to the agency of steam. It is upwards of 60 miles in length, and nearly 40 in breadth, containing about 900,000 statute acres.

Climate.—The climate is generally mild and salubrious, although the north-eastern portion is much exposed to the keen and chilling winds of northern Europe, unmodified, in any material degree, by the influence of a wide expanse of water. Hence in winter and early spring, a north-east wind frequently prevails for many weeks, attended with severe cold, sometimes doing much injury, particularly when accompanied by heavy rains, to fruit blossoms, and the tender shoots of grass and corn. The southern portion of the county, situated below the range of chalk hills, is considerably sheltered from this source of cold; and may be said to have a warmer and more equable climate, particularly where the land has been extensively cleared of wood and thoroughly drained.

Divisions.—There is perhaps no county in England whose physical and agricultural characters are more distinctly marked, and whose productions are therefore more varied, than those of Kent. Any one altogether unacquainted with the science of agriculture or geology, in crossing this county from north to south, cannot fail to be struck with the very manifest diversities of soil, varying physical features of the surface, different modes of culture, and the almost ceaseless variety of agricultural produce that would come under his observation. For the purposes of this Essay, therefore, we shall divide the county into three great sections, in accordance with its geological character, and shall treat of the agriculture of each formation in the descending order.

I. The *Chalk*, having resting upon it detached portions of the London clay, and immediately beneath it the *Gault*, a narrow belt of exceedingly tenacious and heavy soil.

II. The *Green Sand* (provincially termed *Kentish rag*), forming a prominent feature, and running parallel with the chalk through the entire length of the county from east to west.

III. The *Wealden*, comprising the valley of the Weald clay, strictly so called, and the *Iron or Hastings Sand*; together with the extensive alluvium of *Romney Marsh*.

I shall state the principal varieties of soil, the prevalent modes of cultivation, and the average produce of each of these divisions; notice the chief improvements that have been effected within the last half century, and occasionally throw out such hints for a still further advancement as may appear to be necessary and practicable. Such I conceive to be the principal objects sought to be attained by these Essays.

I.—*The Chalk.*

This formation occupies a very large portion of the county, through the whole extent of its northern boundary, running in a direction nearly east and west from Folkstone to Westerham. The escarpment of the chalk on the south presents a considerable elevation, in many places quite abrupt, in which are dug deep pits for supplying the adjacent lime-kilns with materials. This lime has been very extensively used for agricultural purposes, more particularly on the heavier soils in the lower parts of the county, where little or no limestone is to be found. Along the whole northern portion of the county, from Greenwich to the Isle of Thanet, the chalk is overlaid, at different places, with extensive and deep portions of London clay, alluvium, and brick earth—the latter varying much in its texture, from a light sharp sand (in some places abounding in small gravel and coarse pebbles) to a heavy and tenacious clay—generally, however, productive, and in many instances highly so, affording the richest arable land in the county. The alluvium of the chalk formation is found chiefly in the valley of the Thames, where it forms rich and extensive marshes, particularly between the Medway and the Thames, below Gravesend. A large number of cattle and sheep are fed on these flats, and disposed of principally at Smithfield. The greater part of the Isle of Sheppy consists of marsh, while an alluvium may be traced all along the course of the Stour, widening as it proceeds from Ashford, through Canterbury, till the river reaches the sea below Sandwich. The Stour is navigable for barges to within a short distance of Canterbury, and is consequently of some importance to that portion of the county. A considerable breadth of marsh land stretches from Sarre towards Reculver, which, when sound and dry, forms a rich pasture: in many places, however, it requires draining. The London clay is found in patches, generally of small extent. The greatest development occurs along

the Thames and the coast of Sheppy. It again appears near Whitstable, and passes beyond Reculver. The cliffs along this coast vary much in height, sometimes attaining ninety feet; and the destructive effects of the sea are everywhere apparent. On the coast of Sheppy, indeed, and also at Reculver, the washing away of the land is alarmingly rapid, the sea having in some places obtained immense conquests within the historic period, and the work of destruction is incessantly going on. These cliffs abound in copperas and cement stones, which are picked up on the shore, and afford a source of revenue to the owners of the adjacent lands, otherwise greater exertions would most probably be made to check the devastating influence of the waves. The London clay appears again near Stourmouth, stretching to the sea below Sandwich, varying from two to four miles in width. At Allhallows this formation occurs again, stretching towards Merston, from one to two miles wide. This occupies a part of the rich district lying between the Thames and Medway, below Chatham. There are likewise patches of London clay about Erith, Wickham, and Shooter's Hill, but not of any great extent.

Those portions of the county that rest immediately on the London clay, are, with few exceptions, exceedingly heavy and tenacious, difficult and expensive to work, but when well managed, in good seasons produce heavy crops of wheat, beans, and clover. A large proportion, however, is in pasture, some of it of excellent quality. A remarkable feature of some of these pastures is the great number of ant-hills, particularly in the marshes of Sheppy, on parts of which they almost cover the surface. The mounds formed by these little creatures consist of an adhesive clay, and appear very unsightly. When pared and taken off, they occur again as bad as ever in a few years. This soil is generally too wet and heavy for turnips and barley, and requires, under the ordinary system of management, fallowing every few years. Even here, however, the introduction of drilling and the horse-hoe has in great measure superseded the necessity of a whole year's fallow, as formerly practised. The recent extension of the culture of tares has likewise contributed to this desirable end, the crop coming off in sufficient time to clean and prepare the ground for wheat. As most of this land lies conveniently situated for obtaining London manure by water-carriage, its application, especially when under-drained, has astonishingly improved the fertility and mechanical texture of the soil.

In order to give a correct general view of the agriculture of this very diversified portion of England, I can think of no better plan than to describe, as fully as is compatible with my restricted limits, the farming practices of certain districts which occur on each of the formations into which I have divided the county.

I will commence by taking the district lying between Hernehill and Reculver, including the parishes of Seasalter, Blean, Whitstable, Herne, and their vicinities. The soil may be described as generally stiff, resting upon a heavy clay subsoil. The vegetable mould varies from 6 to 10 inches deep: in the lower grounds, however, it is considerably thicker. Nearly the whole of this district, like other portions of the London clay, requires draining, which has hitherto been but very partially effected. In the few cases where thorough-draining has been done, cultivation has in consequence been rendered much easier and cheaper, and the crops greatly increased; ridges have been dispensed with, and but few furrows needed. Depth of drains from 2 to 3 feet, and from 20 to 35 feet asunder. It is difficult, in many places, to get a sufficient outfall without incurring a heavy expense, otherwise the draining might with very great advantage be made deeper.

Rotation.—The following is the more usual course of cropping, although no system of rotation, here or in any other part of the county, is strictly adhered to:—1. Tares; 2. Barley or canary; 3. Beans; 4. Wheat; 5. Clover; 6. Wheat. Tares are usually made into hay, or cut green for soiling horses and cattle. They are sown broad-cast, $2\frac{1}{2}$ to 3 bushels per acre. The process of making tares into hay is very similar to that of clover. The time for cutting them is when they are in full bloom; and care must be taken to shake them about as little as possible, lest the leaf fall off. Being very succulent, the finest weather is required to make them into good hay. I have known excellent hay made of tares by merely turning them in swathes, or allowing them to remain spread abroad for a few days, and afterwards put into large cocks till they are ready for the stack. All kinds of stock are fond of tare-hay; and it is particularly adapted to horses and sheep—better perhaps than to milch-cows. It ought always to be cut before being given to cattle. Barley is not extensively grown, but is of good quality, averaging about 5 quarters per acre. Canary, which is cultivated for its seed for feeding cage-birds, large quantities of it being exported, is drilled in the month of March or April, with 6 gallons of seed per acre. This plant requires a rather close soil, as it is liable, on rich light land, to become root-fallen. It grows nearly as high as wheat; and coming late to harvest, in September or October, the straw is frequently injured by exposure and rain, and used chiefly for litter, although the chaff and offal are excellent food for horses. The crop is very uncertain, averaging perhaps 3 or 4 quarters per acre, while the price varies from 50s. to 100s. per quarter, according to the amount of the crop. A considerable quantity of canary is grown all along this coast to the Isle of Thanet; but its cultivation is considered to be on the decline, and to be an exhausting crop to

the land. Caraways and coriander, formerly cultivated to a small extent, have of late become almost extinct. The whole of this district is admirably adapted for beans. They are either drilled or dibbled, the old broad-cast system being completely exploded. By the former method 3 or 4 bushels of seed are used per acre. Dibbling is performed by hand, $1\frac{1}{2}$ bushel to the acre, at a cost of 7s. 6d., in rows from 18 to 22 inches apart, and the beans 4 or 5 inches asunder. Average produce, $4\frac{1}{2}$ quarters per acre. The sorts generally cultivated are mazagans and ticks. The horse-hoe is universally employed among the row-crops, and considerable manual labour is frequently required to keep the land clean. This soil is also peculiarly adapted to the growth of wheat of the finest quality. The sort most cultivated is the "hoary white," much approved of by the millers, and yielding a large amount of excellent flour. Wheat is almost invariably sown broadcast, from 2 to 3 bushels per acre, the soil generally being too wet and adhesive for drilling; but when thoroughly drained and subsoiled, the drill might be, in ordinary seasons, beneficially employed, thereby saving a considerable amount of both labour and seed. Wheat is generally mown or bagged. The mower has a cradle fixed to a scythe, and strikes in towards the standing corn, which, when cut, is bound into sheaves, and the ground raked, an operation chiefly performed by hand.* Bagging is performed with a stout hook without teeth, of the form of a sickle. The workman strikes the instrument towards the standing corn, as near to the ground as possible. The cost of these operations varies from 11s. to 14s. an acre, according to the state of the crop. Reaping here, as elsewhere, is fast growing obsolete. The wheat harvest in this district is early, generally commencing the latter end of July, which is the case throughout the north and north-eastern portions of the county, except on the stiff and elevated ridge of the chalk, where it is a fortnight or three weeks later, or even more in wet seasons. Turnips and root-crops are but very partially cultivated. Mangold-wurzel has been tried on dry ground with considerable success. With the thorough drainage, however, of this district, it would be difficult to fix limits either to the kinds of crops that might be cultivated, or their amount.

This part of the county, lying close to the sea, is peculiarly well situated for obtaining manures, particularly fish. Sprats, muscles, and five-fingers are commonly put into mixens with earthy and vegetable matters, forming an exceedingly rich and fertilising compost. The cost of sprats is usually about 10d. a bushel: 50 or 60 bushels, when used alone as a dressing for wheat, &c., are

* See Mr. Boys's paper on the Kentish Corn Scythe and Binding Rake in the Society's Journal, Vol. I., p. 444.

applied per acre. Five-fingers 4*d.* a bushel; 120 bushels to the acre. Muscles are generally bought by the waggon-load for about 20*s.*, and 150 bushels applied per acre. Chalk is extensively used on heavy soils, particularly on pastures, and is attended with very beneficial results. Frost and rain soon render it friable, when it easily works into the soil. 16 or 17 tons are commonly put upon an acre; but it will not require repeating for upwards of twenty years, and then in smaller quantities. Artificial manures are but very little used.

The implements of this district are those common to the county. The Kentish turn-wrist plough is in universal use here, as it is throughout nearly the whole of the county north of the Weald. Four horses are almost invariably employed, driven in pairs abreast in summer; but in winter, when irreparable injury would be done by poaching the ground, they are driven singly in the furrow. Two-horse ploughs have been tried, but not found generally to answer. The average depth of ploughing is about 6 inches.

There are scarcely any cattle bred in this district: what few are fattened are of various breeds, but the Welsh predominate. The prevailing breed of sheep are the "improved Kents," either pure or crossed, and are highly approved. Hirings are generally yearly. Rents vary from 30*s.* to 50*s.* per acre, not including wood-land, which is much lower, and difficult to state. Parochial rates, 4*s.* to 5*s.*; tithes, about 1*l.* for arable, and 4*s.* 6*d.* pasture, per acre. These charges, however, vary considerably in different parishes; our statements respecting them cannot therefore be rigidly exact. Size of farms vary from 100 to 500 or 600 acres. Farm-buildings are generally not convenient, many of them being of old construction, and having no adequate provision for economising manure. Horses are generally soiled in yards during summer, a practice that is gradually spreading over other parts of the county. About Whitstable land-springs abound so much that, in consequence, few houses have cellars. The water is hard, and strongly impregnated with iron. Boring for water is common, and very successful. Considerable improvements have been effected of late years by the removal of hedge-row timber, straightening fences, making larger enclosures, and the introduction of draining, in all of which departments very much yet remains to be done throughout this district.*

I come now to describe the farming of an isolated portion of this county, in which the London clay is extensively developed—a district which occupies a prominent and interesting space in the

* I am indebted to Mr. F. Murton, of Whitstable, for much information relative to this district.

annals of British history—the Isle of Sheppy. In addition to a personal examination of this island, I have been favoured with an account of its husbandry by a gentleman eminently qualified, from his long residence there, and extensive experience as a practical agriculturist : *—

“The principal entrance to the Isle of Sheppy is by the King’s Ferry, which crosses the Swale near Iwade. It contains seven parishes, upwards of 20,000 acres, and a population of nearly 11,000. Sheppy has been famed from time immemorial for its breed of sheep, and the exquisite flavour of its mutton; and the epicure of the present day feasts on a Sheppy haunch with the same zest and satisfaction as did his Saxon forefathers. It may be divided, for our purpose, into two parts—arable and pasture land: the latter principally marsh; the whole lying on a clay subsoil of various qualities, but not a good brick earth. The upland or cliff district, commencing near Sheerness, and extending to Warden Point, is nearly all under culture, with a stone-shattery and friable soil, open to the sea. The lower district, adjoining the marsh land which abuts on the river Swale, is favourable for wheat, beans, and canary, but disposed to exuberance of wheat-straw. Farms vary in size from 150 to 500 acres. A prejudice formerly existed against draining, but the march of intelligence is dispelling rapidly the absurdity, and draining is now engaging much attention. The farms, however, being chiefly held by yearly tenure, and the cost of tile-draining being about 7*l.* per acre, no general adoption of this fundamental improvement can be expected until the landlords grant long leases, or provide the capital at a per centage. Matthew Bell, Esq., an extensive proprietor, has commenced the latter system.

“The tillage has been usually six-course, viz.:—1. Summer fallow, with dung, chalk, or lime; 2. Beans; 3. Wheat; 4. Beans and clover; 5. Wheat; 6. Oats. But this extensive system is yielding to the farmer’s necessities; and tares, potatoes, mangold-wurzel, carrots, rape, &c., supersede the summer fallow; and drilled crops of canary-seed, peas, &c., are now common instead of the above rotation. Average produce:—Wheat, 4 quarters; beans, 4 quarters; peas, 3½ quarters; canary, 3½ quarters; oats, 7 quarters; clover, 1½ load per acre. The wheat is generally heavy, but inclined to break strong and flinty, yet it is bought by the London millers to give strength of flour by mixing with weaker samples—the whole produce, except local consumption, going to Mark Lane.

“Turnips are not general, the soil being injured by folding, which thorough-draining would remedy. From this discouraging circumstance, the sheep-breeder is compelled, at weaning-time, to send his sheep away to turnip soils—some thousands annually—to be returned in the spring, often a distance of 30 or 40 miles, when, according as they have been well or ill done by, depends their future value both in carcass and wool.

“The quantity of seed sown is generally large. Wheat, 3 bushels; beans, &c., 4 bushels per acre. I have not for many years sown more

* Mr. G. B. Chambers, Holm Place, Queenborough.

than $1\frac{1}{2}$ to 2 bushels of wheat with successful results, and this practice is extending slowly.

"The marsh land is chiefly stocked with sheep and Welsh cattle. It would be difficult to trace satisfactorily the breeds of sheep, but they were extensively crossed a few years since by Mr. R. Goord's celebrated improved Kent rams, and thereby obtained many good and desirable points. Of late years, Mr. Matson, a resident tup-breeder, has been crossing with the Cotswold and new Oxford rams, with a success that encourages future perseverance. Fat wethers are usually sold at two years old, weighing from 10 to 12 stone, and are chiefly sent to Smithfield. The Sheppy wool is in great favour with the French manufacturers, and is chiefly bought for exportation. It possesses great strength, with length and fineness.

"Of implements but little notice is requisite. The old Kentish turn-wrist plough, with four and often five horses, is in general use—Smart's improved Kent, the Suffolk wheel, the Scotch and Lincoln swing-ploughs, having been all successively tried, and thrown aside. Threshing-machines, both by horse and hand power, are in use, but not general. Crosskill's clod-crusher has been introduced by Mr. Fight; Finlayson's harrow by Mr. Matson, and Garrett's Suffolk drill by Mr. Shrubsole; and are all approved. Pearson's draining-plough by Messrs. Hilton & Co., and the mole-draining-plough by Mr. Noakes, have been extensively tried, but not with the success anticipated.

"Rents average about 25s. per acre; tithe for arable, 10s.; pasture, 3s. 6d. per acre; labour generally high; common labourers from 12s. to 13s. 6d. a week; best workmen, such as threshers, &c. earn from 15s. to 18s. per week. It is a misfortune that the landlords and their agents are generally non-resident; for, independent of the money thus annually drained from the district, it snaps asunder the golden link of sympathy and example by which society is healthfully cemented together.

"The Cliff subsoil is very rich in fossil remains, cement-stone, and copperas, and is a favourite resort to the geologist. The sea is making great inroads, and large breadths of land are annually lost. Although a source of present wealth, yet in time Sheppy may be overflowed like the Goodwin Sands, and become a memento of man's cupidity and neglect."

Liquid manure is here, as in most other districts, too much neglected. Mr. Chambers has a tank to catch the drainage of his yards, with fixed pump, &c. He has applied the liquid manure to pastures, potatoes, mangold-wurzel, and cabbages with great success. Formerly Sheppy was very unhealthy as a place of residence—the inhabitants being subject to ague and bilious and inflammatory complaints. The marshes, too, were often deficient of water for stock: but in consequence of improved cultivation, draining, and efficient sewerage, the climate has much improved, and good fresh water has been obtained by boring, with a permanent supply. The well at Minster, about the highest point of the island, is upwards of 600 feet deep.

The Isle of Thanet, which, strictly speaking, is not now an island, it being connected with the mainland of the county by bridges over a small stream or sewer, has been celebrated from time immemorial for the excellence of its agriculture. The soil in many parts, particularly on the eastward, bordering on the sea, is by no means rich, consisting of a thin lightish layer of mould not more than a few inches in thickness, resting immediately on a pebbled chalk, which at 4 or 5 feet deep becomes a hard rock: to the westward the soil is both richer and deeper; while that portion of the elevated or arable land which adjoins the marsh constitutes a belt of soil unsurpassed in fertility perhaps by any in the kingdom. This land is of a heavier texture, although not difficult to work, than the thinner and lighter soils above, and is excellent for wheat, beans, canary, and clover; indeed for any crop whatever. A peculiar feature of Thanet, with a considerable portion of the eastern part of Kent, is the almost total absence of hedges or fences. There are scarcely any trees, except around the homestead, consequently the country is exposed to all the fury of the winds; which circumstance, connected with the peculiar character of the soil, render the climate cold and dry, and the ground can be worked at all seasons. What little shelter in the form of trees and hedges that existed a few years since have been of late removed in order to make every foot of ground available for cultivation. The openness of the country has, for an arable district, many advantages; but it is not unattended by some drawbacks, such as beating out the ripe corn by high winds, and injurious exposure of sheep in folds during rough and inclement weather. Large thatched hurdles placed on the windward side would tend materially to shelter and promote the comfort of the animals. Even along the highways there are generally no fences, and farms are frequently divided only by stones as landmarks.

Although the soil is generally so light and dry as not to require, except in very rare instances, any furrows, ditches, or under-drains, yet the old heavy turn-wrist plough, with four horses working in pairs, is universally prevalent. Other ploughs of a lighter and different construction have been repeatedly tried and thrown aside; or at best but very partially employed. It must be confessed that this plough, which appears indigenous to this county, makes very superior work, thoroughly moving and turning over every particle of the soil; but in a district like this I cannot help thinking that ploughs of a lighter kind, drawn by two horses abreast, might, with painstaking and perseverance, in some measure supersede the necessity of the heavier implement; particularly in summer working the land: yet it is urged against this view by practical men, that as their soil is peculiarly liable to be overrun with weeds, they require a share from 6 to 10 inches

wide, in order to cut asunder their roots, and such a construction of the mould-board as to turn the furrow completely over, so that more power and a heavier implement are rendered necessary; besides, the treading of the horses out of the furrow is often beneficial in this dry light soil; yet the ploughing is not deep, generally from 4 to 6 inches; in some situations below that depth the chalk is approached. Ransome's scarifier is used, and much approved. The horse-hoe is universal, and incessantly employed. The culture of the district is highly creditable to the farmers; it may be said to be on the whole thorough and clean. Threshing is still done in most cases by the flail.

The greatest improvement effected within the last twenty years is the general practice of what is provincially termed '*spuddling*,' that is broad-sharing, which is done by a share 20 inches wide on the stubbles after harvest, thus eradicating the weeds, the great pest of cultivation in this district.

Rotation.—The general mode of cropping is the four-field course: 1. Wheat; 2. Peas and Turnips; 3. Barley; 4. Clover and Beans; varying the half-tilths in the next course. The smaller farmers, however, frequently take the following course: 1. Wheat; 2. Barley; 3. Clover; 4. Wheat; 5. Barley; 6. Beans. This course is an exhausting one, and can only be sustained by frequent manuring; and in the average of years is not so productive as the four-course.

This district is well adapted to the growth of peas and a fine malting-barley, the Chevalier. The quality of its wheat, however, is not superior, much below that for example of Whitstable and Reculver. The prevailing varieties are the "Golden-drop" and "Seer," both very prolific; the former has a stiff straw, and has become smoother in the bran than when first introduced. The average of wheat is about 4 qrs.; barley, 5 qrs.; oats (of which few are grown), 6 qrs.; beans, 3½ qrs.; peas, 4 qrs. per acre. Sainfoin is cultivated to a considerable extent; it requires a rich calcareous soil to produce heavily, and makes excellent hay. It is usually sown among barley at the rate of 6 bushels of seed per acre; price about 40s. per qr.: when made into hay it is usually shipped for the London market. It is a great error, frequently committed in the island, to keep up this plant too long; thereby exhausting the land, and encouraging the growth of weeds, particularly couch and wire-grass, so that a year's fallow and a suitable summer are required to get it clean. The best farmers say that sainfoin ought not to be allowed to stand more than four years. In the first year after that of sowing, if the ground be well manured and the season favourable, the produce may amount to 30 cwt. of hay per acre. The second and third years, under favourable circumstances, from 40 to 50 cwt.; while

in the fourth and fifth years it will begin rapidly to fail, and couch grass and other weeds commence displacing it; and frequently all will be weeds and the sainfoin choked, and a year's fallow required. Italian rye-grass and trifolium incarnatum have been tried, but their culture does not appear to be established. As to common rye-grass, that is considered a weed, and poisonous to the soil almost everywhere in the county but the Weald.

Wheat is generally bagged or mowed at from 8s. to 10s. an acre; wages 12s. a week: at piece-work higher wages are earned. Cottages are generally comfortable, with small gardens, at rents from 4*l.* to 5*l.* a-year.

Very few cattle are bred in the district. A cross-breed of cows is kept for domestic purposes and the supply of the neighbouring towns. Short-horns have been partially introduced, as have also Alderneys for the improvement of the dairy. The Romney Marsh breed of sheep is universal, and attains to great perfection both as to carcass and wool. Swine appear to be neglected and inferior to most other parts of the county; they are generally white, and frequently coarse, although not so coarse as formerly.

With regard to manures, Thanet possesses some peculiar advantages. A strong north-east wind brings to its shores large quantities of sea-weed, which, when properly managed, possesses high fertilising qualities. After a heavy sea a great number of carts and waggons may be seen along the coast carrying away the weed. It is sometimes applied to the ground in a green state; but the most general and approved plan is to put it into mixtures with other vegetable and animal matters. This easy and cheap mode of obtaining manure, together with a system of clean culture, the absence of hedges and trees, and the dry and calcareous nature of the soil, will account for the high degree of fertility observable throughout this celebrated spot. Farm-yard manure is generally ploughed in for turnips; but some farmers prefer using it as a top dressing to corn, considering that method more economical and equally effective. Bone-dust has been applied to turnips with great success; but other artificial manures are little known. Drilling is universal for all crops. Canary is still cultivated to a considerable extent, but its culture is diminishing; while coriander and caraways have almost become extinct. Mr. Cramp, of Margate, to whom I am indebted for much of my information respecting Thanet, is the principal, if not the only cultivator to any extent of the latter, but its management is exceedingly difficult, and the crop as uncertain. Radish-seed is raised in some places in considerable quantities for the London seedsmen, and in good seasons pays well.

The size of farms is small, very few exceed 200 acres; many of them are occupied by their owners. Rents for arable farms from

30s. to 45s.; parochial rates about 4s. 6d.; tithes 12s. arable; 2s. 6d. to 4s. for marsh land per acre. The rents for pasture land are much higher.

This angle of the county lies peculiarly favourable for the shipment of its agricultural produce for the London market; while it contains several towns celebrated as watering-places, where good markets are obtained for all kinds of vegetables, poultry, milk, and butter.

A large portion of country east of Canterbury is in great measure, as before observed, uninclosed and entirely arable, except the marshes on the south of Thanet and the alluvium formerly left by the sea in the neighbourhood of Sandwich. From behind Deal and Sandwich, including the parishes of Worth, Ash, Wingham, Preston, and their vicinities, to Canterbury, Faversham, and Sittingbourne, the soil mostly consists of a deep rich loam, of a free texture, consequently easily worked, abounding in organic matter, and so happily blended as regards mineral and chemical composition as to be capable of producing, under ordinary management, the largest crops, and of the finest quality. A rich mould is frequently found, which is from $1\frac{1}{2}$ to 2 feet deep. It should be observed, however, that in so extensive a district as that now under review, a diversity of soil obtains, from a sandy loam through every intermediate degree of texture to a stiff clay within 8 or 9 inches of the surface. The richest land occurs in the neighbourhoods of Deal, Sandwich, Canterbury, and particularly Faversham, where the surface is generally level or slightly undulating, easily cultivated at all seasons of the year, and requires but few if any furrows. Patches, however, are to be found resting on a heavy clay substratum, which are subject to springs where draining is highly advantageous. The course of cropping varies considerably; large breadths of turnips being sown and folded with sheep. In the country around Sandwich and Deal the following is the usual rotation:—1. Wheat; 2. Barley; 3. Clover; 4. Wheat; 5. Barley or Oats; 6. Beans; when the course with slight variation occurs again. And such is the inherent strength of the soil that, with clean culture and judicious manuring, this course can be indefinitely sustained.

In the vicinity of Canterbury a considerable plantation of hops has been kept up for a great number of years. The sorts usually cultivated are the "Canterbury grape" and "Goldings," a small, rich, heavy hop; but the crop is not commonly large as compared with other parts of the county, and is frequently subject to blights. These hops, however, when grown free from disease, are of the first quality and command the highest prices. In addition to farm-yard dung, woollen rags and sprats, the latter often applied round the hills, are used as manures for hops. The ground is

cultivated with the greatest care by horse and manual labour at a very heavy expense.

From Canterbury to Rochester there is a belt of country consisting of an inferior chalky soil, in some places abounding in flints and interspersed with extensive woods. This wood-land has of late years become of great value, especially in the vicinity of the hop districts, where an increasing demand exists for poles. Improvements, more or less, have been going on for several years in the wood-lands of this part of the county by grubbing up old and unproductive stubs, and replacing them either with ash or chesnut. Capital judiciously expended in this way returns in a few years a good interest. A considerable portion of wood-land is leased of the Dean and Chapter of Canterbury, under a tenure which prevents improvement to any large extent; and this remark will apply to the arable land belonging to that property.

Very large portions of this part of the county require little or no underdraining. But there are considerable patches of land, more particularly along the valleys of the Medway and the Swale, that are of a more adhesive nature, resting on a clay or stiff gravelly loam, which are immensely benefited by thorough draining. Mr. Fullagar, of Colshall farm, near Milton, who occupies under Lord Harris, has drained extensively for many years with the most satisfactory results: depth of drains from 2 feet to $3\frac{1}{2}$ feet, with tiles or stones. It was on this farm that the celebrated breed of sheep denominated the "New" or "Improved Kents" was commenced, and has been successfully carried on for the last fifty years. A few words relative to the origin and history of this breed will not be deemed irrelevant to the purposes of this essay. Mr. Richard Goord, who is still living, a hale old Kentish yeoman in his eighty-fourth year, commenced his improvements on the Kentish sheep in 1795. He selected nine ewes and one ram from Romney Marsh; these ten sheep, with a few rams afterwards obtained from the late celebrated Mr. Wall, were the original stock from which many thousands have sprung. The principle of breeding in and in Mr. Goord has strictly adhered to through the long period of half a century, and his present flock shows the result. This breed come early to maturity, have a large carcass, broad on the back, short on the legs, the breast deep and projecting, and have a strong tendency to fatten. Their wool is very superior, being both long and fine. We should observe, however, that there exists among the graziers of Romney Marsh generally a strong feeling in favour of their own breeds; their principal objection to the "Improved Kents" is that they are too delicate and tender for so exposed a situation as the marsh. We may instance the following facts, showing their tendency to fatten. A wether, twenty months old, fed on grass only by Mr. C. Cheese-

man, of Fairlight, near Hastings, weighed 152 lbs. dead weight. Mr. Smart, of Rainham, had three wethers twenty months old fatted on grass and turnips only, that gained the prize at the Canterbury Show in 1831, whose average weight was 20 stone $6\frac{1}{2}$ lbs. each. Mr. Oakley, of Darlands, had a twenty months' wether thoroughly fatted that weighed $24\frac{1}{2}$ stone. Mr. Fullager is Mr. Goord's successor, and is in the practice of letting annually a large number of rams. His flock will average $5\frac{1}{2}$ lbs. a fleece.

It is difficult to state the modes of cropping in this district, as they very much differ according to soil and other circumstances. The following is extensively practised, but with many partial variations:—1. Fallow for turnips, mangold-wurzel, &c., manured with dung, bone-dust, or fish; 2. Barley or oats; 3. Beans or peas; 4. Wheat; 5. Clover; 6. Wheat; turnips and other root crops are almost universally drilled and horse-hoed: Matson's and Skirving's swede, and the white and red rounds, are the principal sorts. The white carrot has been partially tried and approved. Tares are not much cultivated, but would be found beneficial on the heavier soils. Trifolium has been partially introduced, and is much liked as food for sheep. Large quantities of swedes, mangold-wurzel, and potatoes are sent to the London market from those parts of this district that are contiguous to water-carriage, and manure is received in return. Much fruit is also grown, there being extensive orchards of apples, pears, and cherries, to which the soil and climate are very congenial.

Many varieties of wheat have of late been introduced; the prevailing are the golden drop, "Seer," "Britannia," and "Hoary White." On the light calcareous lands an excellent barley is cultivated, and is highly productive. Beans are chiefly the Mazagan and small tick. The blue pea is the most prevalent. Of oats the black tartar for horses is highly productive. The average of wheat may be stated at 4 quarters; barley, 6 quarters; oats, 8 quarters; beans and peas, 4 quarters; swedes, 18 tons; mangold, 20 tons per acre. On some of the richer soils near Faversham and other parts of the district the produce generally is considerably higher. But few hops are cultivated, and but little sainfoin or canary. Threshing is performed principally by the flail. Meadows are usually fed by sheep till May; an average crop of hay may be called a ton per acre. As in other parts of East Kent, but few cattle are bred. Short-horns as yet have not found their way here in any quantity. Alderneys are commonly kept for the dairy. Of swine there is a great variety; but a breed denominated "Maylams," after the name of its introducer, more generally prevails. They are black, of a hardy nature, grow fast, with a good tendency to fatten.

Chalk is pretty extensively employed both on light and heavy

soils ; but lime is rarely used. Artificial manures are not much known. Guano and bone-dust, however, are highly approved, particularly for turnips.

Many farmers use their own property ; others have short leases with liberal covenants, but the majority who occupy under large holders are tenants-at-will. Rents from 30s. to 40s. ; parochial rates, about 5s. ; tithes, 11s. on arable and 3s. 6d. on pasture per acre. Day labourers, 12s. a week. Threshers earn from 13s. to 15s. a week. Cottages are tolerably comfortable, with small gardens, generally at rents at about 5*l.* per annum.

There is some excellent arable land lying between the Medway and the Thames, and a considerable extent of pasture and marsh, including the hundred of Hoo and the Isle of Grain. The subsoil is various, in some places a light gravel, in others a good brick earth or stiff clay. Much of this district requires draining, an operation that well repays the cost wherever it has been done with judgment. Drains are usually made from 2 to 2½ feet deep, filled with shells, stones, or tiles, at a cost of 1s. to 1s. 3d. a rod. The most common rotation of cropping is the six-field shift :—1. Turnips, manured with dung and folded ; 2. Barley, beans, or peas ; 3. Wheat ; 4. Clover ; 5. Wheat ; 6. Oats. Averages :—wheat, beans, and peas, 3½ to 4 qrs. ; barley, 6 qrs. ; oats, about 7 qrs. per acre. Leases of seven to twenty-one years prevail. Rents, about 30s. ; tithes, 10s. to 12s. arable, pasture 4s. ; rates, 3s. per acre. Wages, 15s. a week. Cottage rents, with small gardens, from 4*l.* to 6*l.* a year.

A belt of country, about 4 or 5 miles wide, between Gravesend and Dartford, consisting of a light, fertile soil, is in a high state of cultivation, producing large quantities of cinquefoil, early peas, turnips, &c., for the London market. During the “podding season” numbers of women and children are employed from London, Deptford, and other populous towns.

On the top of the chalk range the soil is generally poor and stiff, and in places literally covered with flints and stones. As localities the parts about Cudham, Kingsdown, Stanstead, and Wrotham may be instanced ; although different modifications of the same soil occur more or less throughout the higher portions of the chalk formation. It is a soil most difficult and expensive to manage, sometimes requiring six or eight horses to plough it, and in dry summers its cultivation is almost impracticable. Where this land has been drained, and the hedges kept low, the crops are not only more certain but of much larger amount and come earlier to maturity. The largest flints are taken off for the repair of the roads, but it is considered injurious to remove the smaller ones, since in dry weather they retain a large quantity of moisture to nourish the growing crop. The rotation on the poor

chalky soils may, with some variations, be stated as follows:—1. Turnips; 2. Barley; 3. $\frac{1}{2}$ clover and $\frac{1}{2}$ peas with rape; 4. $\frac{1}{2}$ wheat, and $\frac{1}{2}$ oats or wheat. Rents vary from 6s. to 10s.; tithes, 4s. to 6s.; rates, 1s. 6d. to 2s. per acre. There is much wood-land in some parts of this district, generally of slow growth, and producing excellent and durable hop-poles. The beech and yew flourish on these soils, the former attaining considerable size.

That interesting and important portion of the county occupying its north-western angle contiguous to the metropolis I shall describe in the words of a highly valued correspondent,* a practical farmer, residing in and possessing an extensive knowledge of the district.

“The district to which my communication will apply may be called the north-western corner of the county (my farm is on the border), comprising the parishes of Greenwich, Woolwich, Deptford, Lewisham, Lee, Beckenham, Bromley, Chiselhurst, Eltham, Plumstead, and their vicinities. The prevailing soil is a strong loam varying from 5 inches to 25 in thickness, and depending in its tenacity and fertility partly on the subsoil on which it rests, and partly on the means employed in its cultivation. It is for the most part what farmers call ‘good holding land.’ Its adhesiveness is considerably ameliorated by the frequent application of London manure, of which its proximity to the metropolis affords advantages of frequent and heavy dressings. The colour of the soil also is somewhat altered, from the frequent admixture of manure, and the constant supply of soot wafted in small particles through the air, the effects of which are visible for six or eight miles out of town. It may be seen on the snow in winter, on linen hung out to dry, and in the colour of the sheep grazed in the neighbourhood. This constant supply of soot is supposed to account for the fact that a dressing of that substance applied in the usual way as manure, and which is found so efficacious in many situations, has no visible effect here. It is a difficult soil to cultivate; depending so much on the seasons, it requires a great proportion of strength to get through the labour while it is in a good humour; poaching it with horses when wet is most injurious. Give it plenty of those essentials to fertility, sun and air, and keep off as much as possible the superabundant water by thorough under-draining and water-furrowing, and you may expect good crops. But on the contrary, if you farm it ever so well, make the best summer fallow possible (and the finer the tilth the worse), and allow the water to remain on it till it squashes under your feet in walking over it, and you will grow nothing but weeds. Summer fallows, however, are now but seldom made, unless in very unfavourable seasons.

“The subsoil of the centre and level part of this district is a yellow clay, varying in its composition from a mild loam, or brick earth, to a strong adhesive tile clay, with here and there an admixture of sand.

“The ordinary mode of farming is to lay the ground in ridges, called ‘half-rod lands,’ or oftener ‘five-bout lands,’ with a round or swing-

* Mr. George Colgate, Brockley Green Farm, Lewisham.

plough. The turn-wrist plough is but seldom used. These implements are known as the patent cutting-ploughs, made chiefly of cast iron; the beam and handles generally of wood. They are somewhat heavier than the Scotch plough, being long in the handles and short in the beam. They were introduced into this part of the country about twenty-five years ago by Mr. Cooke, the patentee, and have been found so well adapted to the soil that they have entirely superseded the old wooden swing-plough in general use before that time, and continue to excel all other descriptions that have been brought into competition with them.* The process of harrowing is generally accomplished on the five-bout work with a gang of three harrows of four trains each, coupled to each other by short chains and hooks, and are just wide enough to cover the ridge; they are drawn by two horses, one in each furrow, attached to each end of a whipple-pole 9 feet long. Drilling is commonly practised with the horses walking in the furrow. The fields in this district are of moderate size, averaging about 8 to 10 acres; they are not much encumbered with timber, and the sooner they can be well rid of what they have the better for their owners. It has been too much the practice, both as regards timber and game, for landlords to let their land and stock it themselves.

"The northern part of this district, which lies contiguous to and is bounded by the Thames, comprising the parishes of Deptford, Greenwich, Charlton, Woolwich, Plumstead, &c., is chiefly cultivated as market-gardens, excepting a portion of marsh land immediately adjoining the river, which is used as meadow, producing large crops of grass, but of a coarse quality when made into hay. This tract of land, however, is excellent for grazing and fattening purposes.

"The market-garden land rests on a drier subsoil, which consists principally of gravel, sand, or chalk. It is cultivated partly with the plough and partly with the spade. The subsoil-plough has recently been used with great advantage. The high state of cultivation in which this land is kept, and the great perfection attained in the quality and quantity of the vegetables produced, are evidences of the elastic productive capability of the soil, and of the intelligence and industry of those engaged in its cultivation. It is but justice to notice here the great improvement effected in the growth of several kinds of fruit and vegetables by Mr. Myatt of Deptford; who has likewise been eminently successful in growing mangold-wurzel, having obtained from 50 to 60 tons of the root, exclusive of leaves, per acre! These extraordinary crops, however, can only be obtained by a large outlay in manure and labour. It is no uncommon thing for these market-gardeners to lay on 100 or 120 tons per acre of the very best London dung, which is generally brought on in large carts containing from 2 to 3 tons; each cart-load costs on an average 7s. Mr. Myatt pays 500*l.* a-year for dung brought from London by the cow-keepers, carmen, and others, independent of what his own teams bring home, for less than 100 acres of land! The rent of this market-garden land ranges from 3*l.* to 5*l.* per

* Messrs. T. and D. Mack, agricultural implement makers, Greenwich, continue to make these ploughs.

acre; rates from 8s. to 10s.; tithes 10s. to 12s. per acre. Here is no summer fallowing; for no sooner is one crop off than in goes another of perhaps plants which have already attained part of their growth. The expenditure in manual labour is also very great. This is for the most part done by piece-work, at rates which enable a good workman to earn 3s. or 3s. 6d. a day the year round. A great number of women (chiefly Irish and Welsh) are also employed, who get about 1s. to 1s. 6d. a day.

"In this district, lying within 10 or 15 miles of the metropolis, it is usual to sell the greatest part of the wheat-straw, and as much hay as can be spared, and to purchase manure in return, at a cost of 10s. or 12s. a waggon, or 4s. to 6s. a cart-load. It is found that very few of the light manures answer so well here as on some other soils. Gypsum, bone-dust, guano, &c., are not to be depended upon, and salt has been found to render this land more stiff and less productive, perhaps from destroying too many of those industrious underdrainers—the worms, and also by causing the land, already inclined to wetness, to imbibe and retain a greater portion of moisture.

"Farmers are becoming more and more alive to the importance of liquid manure. I have been induced to make several tanks of brick-work lined with cement, for catching the drainage of my cow-house, stables, yards, &c. The expense, I believe, was repaid the first year, and the manure is incomparably before guano or any light dressings. Manure from fellmongers and tanners' pits, consisting of lime-washings and the fleshy refuse of hides, &c., is considerably used, but it is various in its qualities and effects. Sugar-scum is employed as a fertilizer in the neighbourhood of Cudham, Shoreham, Farningham, &c., principally for turnips, at the rate of 4 or 5 tons per acre; costs in London 10s. to 15s. a ton. Some of the best and most experienced farmers have continued to use it for many years with satisfactory results, but of late there have been complaints of its being adulterated. Among those who have had much experience of this manure may be named Mr. Moxam of Cudham, Mr. Waring of Chelsfield, Mr. Tonge of Chevening, Messrs. Love, Brookers, and Spain, of Shoreham, &c.

"The neighbourhood of Cudham, Farnborough, Chelsfield, and Orpington, lies between Bromley and Holmesdale; it is hilly, verging on chalk, consisting of turnip, barley, and saintfoin land, not very rich, but when straw can be got, yielding well in grain. The common turn-wrist wheel-plough is used almost exclusively, and the land ploughed plain. There is but very little meadow-land, consequently but few cattle are bred; but large numbers of sheep, chiefly Southdowns and half-breds, yielding good mutton and excellent wool. The usual course of crops are—1. Turnips; 2. Barley; 3. Clover; 4. Wheat, and sometimes oats, with occasional substitutions of peas, tares, beans, &c. The part here described forms a connecting link between what may be called the Lewisham level and

"*The Holmesdale Valley*, which is one of the most fertile as well as delightful valleys in the delightful county of Kent, comprising the parishes of Westerham, Brasted, Sandwich, Chevening, Sevenoaks, Otford, Shoreham, Kemsing, Seal, Eynsford, Farningham, Horton

Kirby, Dartford, &c., lying on the sunny side of the chalk hill, like a forward border under the lee of a garden-wall. Its centre is watered by the Darwent, which rises near Westerham, and driving in its delightful course several mills, falls in with 'Old Father Thames' at Dartford. The soil is much diversified, and consequently the system of farming. Immediately at the foot of the chalk ridge is a tract of dry fertile land easily tilled and kept clean, and of sufficient staple to produce excellent crops; it is somewhat intermixed with small stones (stone shattery), which in a great measure modifies its otherwise adhesive disposition. Next occurs a belt of land denominated 'black ground' (*Gault*), and surly ill-tempered stuff to be sure it is to move, frequently requiring six horses to get a plough through it, and from its adhesiveness the furrow is so muddled about that it is difficult to discover which way the plough has gone. When it is in a state between wet and dry the ploughman may do a day's work and never be able to see either share or chep; and yet this land produces generally very good crops of wheat, beans, clover, tares, and oats. This soil ought to be worked with the patent cutting-plough and laid in ridges, instead of being, as it generally is, ploughed with the turn-wrist plough, and laid plain. It is far more difficult than a strong clay to work, and often suffers much from the treading of horses.

"Hops are grown but rather partially all through the valley; and with the increased attention paid of late to the cultivation, picking, and management, the growth of this district stands in rather high estimation in the Borough Market. The sorts mostly cultivated are, the 'Goldings,' 'Grape,' 'Jones's,' 'Waring's Imperial Green,' raised by Mr. Waring of Shoreham nearly a century back, and the 'Colgate,' raised by my father, Mr. David Colgate of Chevening about forty years ago, from a single plant, probably a seedling which he found growing wild; and which are now extensively cultivated in many parts of Kent and Sussex. They are found to be very productive, and to retain their colour and condition for late picking better than other sorts.

"It has been found that the 'seed,' or male plant, increases the growth of the hops, and also the quantity or 'condition,' and consequently the weight of the crop; a circumstance not so generally attended to as it ought.

"The north-western district has no great reputation for the breeding of cattle; and the working of bullocks has almost entirely ceased. The Greenwich, Woolwich, Plumsted, and Erith marshes, are the only tract of land where grazing to any considerable extent is practised, and this chiefly for fattening, to which much of it is well adapted. The meadow-land which is interspersed in other parts is not famous for the growth and thrift of cattle. Those brought here from the breeding counties of Northamptonshire, Leicestershire, &c., are sure to deteriorate in their condition. Within 10 or 12 miles of London many milch cows are kept, chiefly short-horns. The milk is sent into 'town' by the farmer, or fetched from the 'barn' by the retail dealer, who usually assists the farmer or cowman in milking, thereby having an opportunity of seeing that the neat cattle yield neat milk, reserving to himself (if he should find it expedient) the business of rectification. The cows are

(a thing not usual with the London cow-keepers) calved in as long as their age and constitution admit, and are afterwards fattened. They are kept at grass during summer, and on roots, hay, and grains from the breweries and distilleries in the winter. It is found that the quantity of milk is much increased by keeping the cows in a warm sheltered shed, instead of being exposed, as is too much the case in some districts, in open yards. By keeping them warm they do better on less food. Further from London the milk is made into butter, or is used in fattening calves for the London market."

The rate of wages in the Holmesdale district is usually 12s. a week; by piece work, however, the labourer gets more, 14s. to 16s. In the Lewisham level, 15s. a week for good workmen is common; and for piece-work the average earnings may be stated at 18s. These prices have varied but little for the last quarter of a century. Threshing is generally done by the flail, and paid for by the quarter, sometimes by the truss of straw produced. For wheat, from 5s. to 6s. a quarter, including the binding of the straw, which is done in the most neat and workmanlike manner for the London market. For Lent corn, from 2s. 6d. to 3s. 6d. a quarter; when done by the truss, as is the case in threshing rye, and sometimes wheat, from 2d. to 2½d. per truss is about the usual price. The old custom of giving labourers beer has here, as in most other parts of the county, been generally discontinued, except perhaps during hay-making and harvest.

II.—*The Green-sand Formation*—(provincially, *Kentish Rag*.)

This formation occupies a central position, and runs through the county parallel with the chalk-hill, in a direction nearly east and west. It varies much in breadth, from 3 to 6 or 7 miles; its greatest development being between Peckham and Snodland. Like that of the chalk, its southern slope is the steepest, overlooking the valleys formed by the Medway (in part), the Eden, and the Beult. The soil on this formation, of course, varies; but it may be said generally to be of an open friable character, containing much calcareous matter; in some places abounding in small stones formed by the abrasion of the subjacent rock: it is easily cultivated, requiring in most places little or no underdraining, and is highly productive in corn, vegetables, hops, and fruit.

There is a narrow belt of land lying between the green-sand and the chalk, already briefly adverted to, which seems to require a more distinct notice, since its agricultural character and management are widely different from either—the *Gault*.

It consists of a dark-bluish clay, exceedingly heavy and adhesive, its particles being of an impalpable nature. A favourable section of this formation may be seen in the cliff facing the sea at Folkestone—a spot celebrated for the beauty and perfection of its fossils.

Although a heavy and stubborn soil, yet when judiciously managed and in good seasons, this land produces large crops of wheat, beans, clover, and oats. On both of its sides, however, immediately adjoining, may be found the materials for ameliorating its texture, and permanently raising the standard of its fertility—the chalk and the green-sand. With a proper admixture of these materials, in connexion with under-draining and strict attention to ditches and water-courses, this belt of land might be rendered far more productive. At present it consists mostly of pasture.

We now come to describe the agriculture on the green-sand, or Kentish-rag. The eastern portion of this district varies considerably in the nature and composition of the soil. About Sandgate, Cheriton, Hythe, Saltwood, &c., much of the land is of a very light texture, exceedingly well adapted for turnips and barley, large breadths of which are cultivated, and great numbers of sheep are bred and fattened. This soil is benefited by the treading of animals, particularly for wheat; hence the sheep-fold is universal. There are portions of land, however, of a heavier texture, abounding in springs, where underdraining would be highly beneficial. In the neighbourhood of Ashford this certain means of agricultural improvement has been increasingly applied within the last ten years upon gravels resting on a substratum of clay; the depths of drains varying from 3 to 6 feet, made either with tiles or stones. On the lighter soils of good quality the seven-field course is frequently adopted, not however without many variations.

1. Fallow for turnips, manured generally with dung; 2. Barley; 3. Beans, with a dressing of dung; 4. Wheat; 5. Clover; 6. Wheat, manured; 7. Oats.

This rotation is found to answer well on the farm of Mr. Walter Murton, East Stour, Ashford. Average of wheat about 4 qrs.; barley, 5 qrs.; beans and peas, 4 qrs.; oats, 6 or 7 qrs.; Swedes, 300 to 500 bushels per acre. Farms vary from 100 to 250 acres; generally yearly hirings. Rents about 30s.; tithes, 6s.; rates, 3s. per acre.

The district known as Mid-Kent, in which is situated the county town of Maidstone, presents several interesting and remarkable features. Taking its agricultural resources altogether, the range and variety of its produce, there cannot be found any spot to compare with it in the United Kingdom. It has been truly designated "*the garden of England*." I have been favoured with much interesting and valuable matter from practical farmers residing in this district, of which I propose making a free use. One of my correspondents, a gentleman long acquainted with the district now under review, writes as follow: *—

* Mr. Robert Golding, Hunton.

"The soil of Mid-Kent varies materially; though perhaps it may be classified, if not among the light, yet certainly among those which are free-working and friable. Upon the 'rag-stone' rock the soil is generally of a very productive and valuable kind, largely occupied by hops and fruit; and within a semicircle of a few miles' radius south of Maidstone, occurs the chief plantations of Kentish filberts. These are carefully cultivated and pruned back, not allowed to exceed 5 or 6 feet in height, and are kept of a basin-like shape. The crop is uncertain, sometimes realizing a large sum per acre, and is sent principally to the London market. The land lying upon this formation is mostly sound and dry, the porous nature of the rocky subsoil freely admitting the escape of water. A large proportion of the hops grown in this district are of the far-famed 'Golding' variety; and in consequence of their strength and aromatic richness, command high prices in the market. Upon heavier and wetter soils a less precarious kind of hop is cultivated; such as the 'Grape,' 'Jones,' and other hardy varieties. From the well known superiority of the Mid-Kent hops they are much sought after by the great London brewers, and are very generally packed in bags. The great drawback to the planters' success in this district is the greater liability of the finer sorts of hops to blights, particularly the *mould*; for while the coarser and more hardy kinds in the Weald are frequently free, this disease for several successive seasons blights more or less the fairest prospects.

"There is nothing like a general rotation of crops in this district. Some manage to get good crops of wheat (from 4 to 5 quarters per acre and upwards) in each alternate year, by the intermediation of green crops—chiefly clover and tares. These last are frequently carted home for soiling: the land, after being well cultivated and manured either with dung, rape-dust, guano, &c., is often sown with turnips, the artificial manures being generally drilled with the seed. A good crop of turnips—not unfrequently swedes—is thus procured after tares. Turnips, being fed by sheep, with oil-cake, the land is again in condition for wheat, sown usually about November or December, or later. I have known this year upwards of 5 quarters of wheat per acre grown upon rather an inferior soil thus treated. While a large portion of the swedes are consumed by sheep on the ground, the remainder are eaten by cattle in yards. Gardner's turnip-cutter has become an almost universal appendage to the sheep-fold. One fact should be observed in relation to our position; viz., our *southern situation*. While in the north swedes must be sown early in May, in Norfolk before its end, but with us we frequently sow late in June; and even the last year, in many respects so unfavourable to vegetation, I knew a good crop of swedes and the yellow-hybrid turnip (the latter obtained the prize at the last Maidstone show) that were not sown till the 2nd of July. I mention this merely to show what the double-crop system will do.

"Of course great improvements have taken place in this county since Boys's survey; but were I to state that, like the greater part of England, more has been done to increase the fertility of the soil within these last ten years than in the other thirty, I should probably be not far wide of the mark: the wet soils, of course, are those evincing the greatest im-

provement. Draining has done, and is doing everything for them. The land in this district has been extensively cleared of its hedges and thrown open. Some of the great proprietors, it is true, continue to hold a large proportion of the land in their own hands through their agents, the timber trees; while the occupying proprietors of small estates, knowing that timber can be grown on land not one-third the value of their own, suffer not a stick to stand, save either on grass or wood-land. The advantages of air, light, and deep culture are beginning to be appreciated, and their effects shown, by the far heavier crops of the present day.

"On well managed estates every yard of wood-land, and nooks and corners of fields, are filled up and planted with wood, the hop-grounds rendering the growth of poles a prime consideration. Many of the sterile soils on the top of the chalk range of hills grow the very best poles; and instances are frequent where plantations have been made and attended to, that a fall of ten or twelve years' growth has realized more than double the value of the fee-simple of the land under other circumstances. The favourite kinds of wood are ash, chesnut, and red willow.

"There are some localities in this county in which a large proportion of the tillers of the soil are also its owners. This parish (Hunton), for instance, affords an illustration of this independent rate, 'the sturdy yeomanry.' Of seventeen occupiers of land, twelve or thirteen are its proprietors. Farm buildings are in general pretty convenient; while we have many instances of very superior homesteads belonging to the occupying proprietors. Cottages are very generally roomy and comfortable, with gardens attached. I have no hesitation in stating that in no district of England is the agricultural labourer better, if so well, paid as in the hop districts of Mid-Kent. Twelve shillings a-week for day-work even in winter; while the greater part of the rest of the year he has well-paid piece-work, which with his *double harvests* for himself, wife, and children, render his lot, with sobriety and good conduct, one of comparative comfort and happiness."

In this district the centre of hop and fruit growing, an enormous expenditure takes place for manures. Hops are great exhausters of the soil, and require, and generally receive, a very expensive cultivation. Fattening cattle with corn and oil-cake is very generally practised to a large extent in all the hop districts, which nothing but the all-receiving and frequently all-paying hop-garden would justify. I have not been able to obtain a correct statistical return of the cost of oil-cake and artificial manures, but I should think that it would amount to nearly half the rental of the whole county, which cannot be far short of a million per annum. In the hop districts I know of several instances where the cost of oil-cake and artificial manures considerably exceeds the rental. Woollen rags and Yorkshire mill-waste are commonly applied at the rate of a ton or upwards per acre. The price of the former usually ranges between 5*l.* and 7*l.*, and the latter 3*l.* to 5*l.* a ton. Sprats for hops, corn, and turnips,

have been in pretty general use for the last 15 or 20 years. The cost is from 10*d.* to 1*s.* 2*d.* a bushel, according to the supply and the point of the Medway where they are unshipped; from 50 to 70 bushels are applied per acre for hops, and about a third less for corn and turnips. Rape-dust has been for some time in use for the same purposes, but generally in summer culture; while guano and bone-dust have been used with general satisfaction.

Irrigation is not carried out systematically to any considerable extent in this county, although it is practised in some places. Its adoption might be extended to many localities with great advantage; care being taken not to flow the land in summer where sheep are kept, as they would be exposed to that fatal malady the rot. About Edenbridge and other western parts of the county there are many instances to be seen of conducting water over grass land by "catch work," or a few simple cuttings. The waters of the Darwent are frequently employed for the purpose of irrigation in various places along its course. Lord Torrington has very satisfactorily introduced the system on the land in his own occupation. Mr. Golding, of Hunton, has been at considerable pains and expense in conducting a small stream over his meadows with most satisfactory results. I may also mention Leeds Abbey farm, where irrigation has been beneficially carried on from time immemorial; perhaps from the time when the land was held by the monks, who, it is pretty certain, despite of all the abuse that has been heaped upon their memory, were the great agricultural improvers of their age. The Kentish irrigators might learn some useful lessons by an inspection of the water-meadows in our western counties.

Of the breeds of cattle in Mid-Kent but very little can be said; they are a most heterogeneous mixture of various kinds: some adhere to the Sussex breed. Mr. E. Beard, of Broughton Monchelsea, and Mr. T. Martin, of East Peckham, may be mentioned as producing very fine animals. Lord Torrington, Mr. Tassell, of Malling, and Mr. Golding, have of late introduced some excellent animals of the pure short-horn—an example, it is much to be desired, that will spread. Of sheep, this district has two kinds, Kents and South-Downs. The former consist principally of Mr. Goord's variety, and carry off the palm. The Downs are, however, in many respects well adapted to the district, being better to work in the fold than the Kents, and produce a very fine wool and exquisitely flavoured mutton. The breeds of swine have very much improved of late years, Mr. Beard, of Broughton, having some very fine specimens.

Among the enterprising cultivators of Mid-Kent we may instance Lord Torrington, of Yotes Court, Mereworth, who has within a few years done much to improve both the agriculture

and stock of this important section of the county. When his Lordship's farm fell into his own hands, some half dozen years ago, it was in a bad, exhausted condition. By grubbing trees and hedges, and thorough draining wherever required, in connexion with a system of deep and clean culture, making a large amount of manure by keeping an increased number of cattle, folding a large flock of sheep on turnips, clover, tares, &c., with a liberal allowance of corn and oil-cake, an astonishing change has been effected; and heavy crops are now obtained of every species of production belonging to this highly cultivated district. His Lordship's farm consists of 500 acres—divided as follows:—

Acres.
62 Hops.
20 Fruit.
182 Meadow.
236 Arable.

Arable land, as cropped in 1845:—

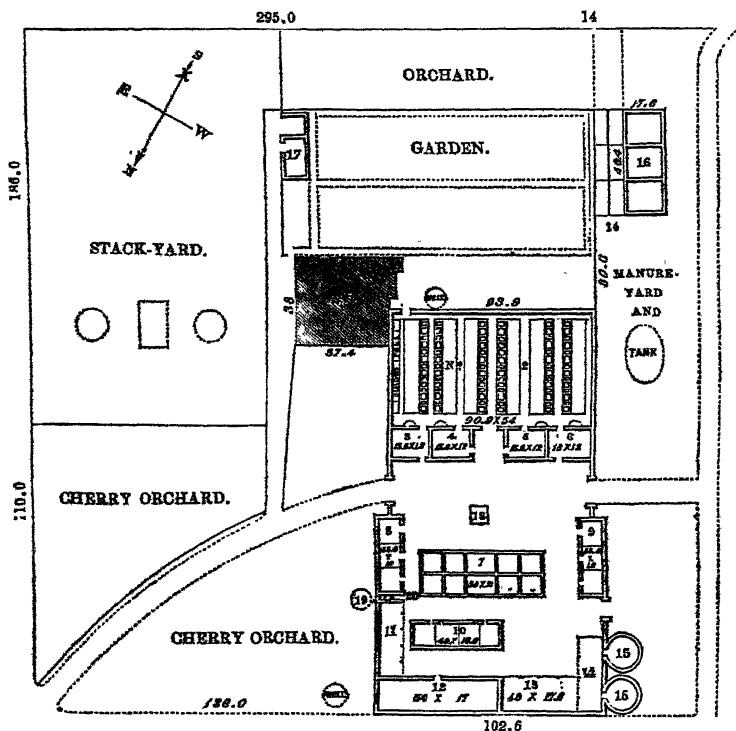
	Acres.		Acres.
Wheat . . .	82	Peas . . .	31
Barley . . .	27	Lucerne . . .	9
Seeds . . .	15	Roots . . .	55
Beans . . .	14	Rape . . .	3

Course of cropping:—1. Turnips, folded off, preceded by rye or tares; 2. Barley; 3. Seeds, second cut folded; 4. Wheat; 5. Beans or peas, manured; 6. Wheat. The cost of oil-cake and corn for the consumption of cattle and sheep on the farm exceeds 1000*l.* annually. The soil is various; generally light and stone-shattery, resting on the green sand-stone: in some places the rock crops out. I was surprised to see such splendid turnips on this thin soil after the parching summer of 1844. This and the grain crops were proofs of what high farming will do. And after all that can be said, this kind of farming is the cheapest, and, in the end, the most profitable.

Lord Torrington has likewise recently erected a very capacious, convenient, and elegant homestead, which is certainly without a parallel in the county; and is calculated to effect a much-needed reform in this very important branch of rural economy. The accompanying ground-plan of the new homestead at West Peckham, with the few words I shall offer in explanation, will enable the reader to form an idea of the disposition of the buildings; and, for full particulars, he is referred to his lordship's recent publication, which will be found well worth a careful perusal.*

It appears to have been the chief object of Lord Torrington's

* 'On Farm Buildings, with a few Observations on the State of Agriculture in the County of Kent, by Viscount Torrington.'—London, Ridgway, 1845.



PLAN OF THE HOMESTEAD AT WEST PECKHAM, &c.

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|--|-------------------|-------------------------------------|
| 1. House. | 7. Corn Barn. | 14. Cart Lodge, with Stowage above. |
| 2. Cattle Lodge. | 8. Byres. | 15. Hop Kilns. |
| 3. Boiling House. | 9. Byres. | 16. Cottages. |
| 4. Turnip House, with Cakes Room above. | 10. Pigery. | 17. Stable and Chaise House. |
| 5. Hay and Chaff Room, with Granary above. | 11. Workshop. | 18. Home Power. |
| 6. Straw Barn. | 12. Stables. | 19. Privy. |
| | 13. Waggon Lodge. | 20. Tool House. |

design to erect a farmery on strictly systematic principles, so that there should exist a mutual connexion between all its various departments. Accordingly, we find in this homestead all the offices requisite on a farm placed together, and with every attention to their relative disposition and convenience. All, therefore, that relates to the threshing and cleaning of corn—the preparation of food for animals, with their general management—the economizing and mixing of manures, with all the numerous details belonging to the homestead of a farm—are at once brought under the eye of the owner, or his superintendent, with the least loss of time and personal inconvenience.

The cattle-lodge (No. 2) is a capacious and noble building, capable of holding fifty-three head of cattle and nine calves, allow-

ing them ample room and perfect ventilation. The height of the walls is 11 feet, and to the top of the roof, which consists of only one span, 26 feet. The length of the lodge is 90 feet in the clear, by 54 feet wide. It contains six rows of mangers, to which the animals are tied; each being provided with a separate trough and cistern, so as to prevent any interference with one another. In this building it is comparatively easy, at all seasons of the year, so to regulate the temperature as to promote the health, comfort, and well-doing of the stock.

Connected with the large cattle-lodge are, the boiling-house for steaming food, the turnip-house and cake-room, the hay and chaff room, with granary above, and also the straw-barn. The machinery, placed in their different offices, for cutting hay, straw, turnips, oil-cake, &c., is connected with the horse-power by an underground shaft.

Among the novel features of this homestead is the comparatively small size of the barn (No. 7), which is 60 feet long and 21 feet wide, built entirely of wood upon stone quoins. Each head will hold 30 or 40 quarters of unthreshed wheat, while the others will take a portion of the straw. The threshing-machine is placed on an upper floor in the centre of the building, 6½ feet above the cleaning-floor. The whole operation of threshing and preparing corn for market is performed by one power, and at one time.

There can be no doubt that the practice so common in this country of having two or more barns, of large dimensions, and sometimes widely separated from each other, even on moderately sized farms, is wholly unnecessary; involving a heavy expense upon the landlord, without affording any corresponding benefit to the tenant. Corn carefully secured in stacks keeps much better than when placed in barns. Lord Torrington's principle involves also another great advantage, which is not sufficiently appreciated in many parts of this country, viz., *threshing by machinery*. It is obvious at once, that whatever amount of manual labour is expended in threshing, &c., after the crop is gathered in, will not increase it a single grain. Whereas, if that extra, and therefore profitless, labour were judiciously directed to draining and a higher cultivation, more abundant harvests would be reaped.

The vast stable, implement-lodge, and piggery, together with a number of smaller offices, as shown in the plan, are all conveniently constructed with a view to economic labour and systematic details. There are likewise admirable arrangements for carrying off whatever amount of water may come from the roofs of the various buildings, by cast-iron gutterings; while the whole of the liquid excrements of the cattle is conveyed into a capacious tank.

The buildings (with the exception of the barn) are of stone, dug

on the farm, with slated roofs. The doors and gates are not hung upon hinges, but slide upon wheels on an iron rail.

The total cost of the homestead, which is throughout of a most substantial character, and does great credit to the builder, Mr. William Mair, of West Malling, was 2270*l*. There are always several expenses incidental to the carrying out of a new design, which subsequent experience would obviate. The same accommodation might be provided for a smaller sum by adopting a less expensive style of finish, that would be equally well suited to the wants of a tenant.

I ought not to conclude this brief and imperfect description without a distinct allusion to Lord Torrington's zeal and liberality in promoting agricultural improvement. The completion of the homestead was celebrated by a splendid entertainment, such as I could wish to see more common in England; his lordship invited upwards of five hundred farmers of the county, besides some distinguished agriculturists from different parts of the kingdom, to inspect the buildings. Such an occasion I regard as furnishing an interesting and hopeful page in the agricultural history of Kent.

The district of Mid-Kent supplies Covent-garden market with probably near two-thirds of home-grown fruit,—a few miles south of Maidstone, comprising the parishes of Barming, the Farleighs, the Suttons, Loose, Boughton, Linton, &c., being the best adapted localities. It is a frequent practice to raise a hop, apple, and filbert plantation simultaneously on the same ground. The soil is frequently trenched 18 inches deep; sixty apple trees are usually planted on an acre, filled up with hops and filberts. The hops are beneficial to the young fruit trees by the shelter they afford, and with the thorough cultivation and manuring which the ground receives, tend to bring the trees to early maturity. The hops usually stand about 14 years, when they are taken up to allow more room for the trees; the filberts in general will require to be removed in about 25 years, when the fruit-trees will need the whole of the ground. The favourite sorts of apples are the *Ribstone Pippin*, *Nonpareil*, *King's Pippin*, *Quarrentine* (*Red*), *Winter Queening*, *Goff* (great and sure bearers), *Golden Nobs*, *Wellington*, *Rayners*, *Farleigh Pippin*, *Gooseberry Pippin* (an excellent late apple), *Silver Russett*, *Golden Pippin*, *Five Crowns*, *Blenheim Orange*, &c.

Pears require the land tilled whilst young, but when arrived at maturity they bear and do well in pasture. I will mention the plan of the late well-known J. Braddick, Esq., of Boughton Mount, who was celebrated for his knowledge of fruit, particularly pears. His son, the present J. W. Braddick, Esq., scarcely ever fails to obtain the prizes at the horticultural show for pears, which

are of the very finest quality. His best sorts were planted in trenched ground, and trained to the very extensive walls of the farm buildings; and in many instances from 20 to 50 sorts were even worked on the same tree! The choice sorts are the *Maria Louisa*, *Williams*, *Bon Chrétien*, *Charmontelle*, &c.*

Beside the three crops already mentioned growing on the same ground, several others are sometimes seen; as gooseberries, raspberries, white and black currants, &c.; every inch of soil being turned to some profitable account. The fences of this district are commonly quickset and very ornamental; they are neatly trained, and around hops and fruit are allowed to attain a great height to afford shelter from high winds. The height of quick-hedges varies from 5 to 16 feet, or upwards, being kept within a width of 2 or 3 feet. This part of the county stands unrivalled for hedge management. In short, the beauty and immense productiveness of this district must be seen before it can be fully understood.

The slope of the rag-stone hill, looking over the Weald, is the most favoured spot of this most-favoured locality. It abounds in hop gardens and fruit plantations of the most fertile character, and is peculiarly adapted to the filbert. There is a very narrow belt of land running along the escarpment of the rag-stone, provincially called *Coomb* (the debris of the Green-sand, connecting it with the Weald clay below), which, although of a very heavy and adhesive texture, is astonishingly productive in hops, fruit, and grain. This land is sometimes so wet and stiff as to set the operation of ploughing at defiance; draining it, however, will materially alter its character, and this method of improvement is being extensively practised. The natural fertility of this soil is owing to its happy mineral composition and the large amount of calca-reous matter it contains. It is worthy of remark in reference to fruit, that mowing the grass in *cherry orchards* is a most injurious practice, causing the fruit to fall before it attains maturity, by suddenly exposing the surface of the ground to the action of a powerful sun. The most common sorts of cherries are *Adam's Crown Hart*, *May Dukes*, *Black Hart*, *English*, *Flemish Big-room*, &c.

In the hop districts of Mid-Kent no set system of rotation can be said to obtain; comparatively speaking, but little corn is grown, the main staples being fruit and hops. All the operations of the farmer have, more or less, a reference to these principal crops. Farms are generally small, from 20 to 100 acres. Rents will vary from 30s. to 4l., according to the quality of the land and the amount of hops and fruit. The usual course of cropping among

* Mr. Thomas Kemp, Loose.

the larger farmers is,—1. Swedes, well manured and fed off with sheep (Downs principally) upon oil-cake; 2. Barley or oats; 3. Clover; 4. Wheat; 5. Peas or beans; 6. Wheat. Dung is generally used as a dressing for wheat, beans, and peas. Some substitute in the third year beans for clover, and in the fifth year clover for peas and beans.

On land of second-rate quality the five-field course is common:—1. Turnips on fallow; 2. Barley; 3. Clover or trefoil; 4. Wheat; 5. Oats. This is found to bring the clover tilth too often; to remedy which the following is sometimes adopted:—

1. Turnips; 2. Barley; 3. Half clover, half peas or tares; 4. Half wheat, half oats; 5. Half oats, half peas. This brings the clover round only once in 10 years, when the crop becomes much more certain. The average amount of produce—for wheat, about 4 qrs; oats, 6 or 7 qrs.; barley, 5 qrs.; beans and peas, $3\frac{1}{2}$ or 4 qrs. Upon the inferior soils of the district the averages are considerably lower; and in superior soils, with high farming, they are consequently greater.

But little can be said respecting the implements of this district in addition to what has been already observed in reference to other parts of the county. The one-horse single drill is much employed on the arable lands of the fruit district, and is well adapted to the soil, which for wheat requires treading, and in wet seasons it is desirable to sow up to the plough every day. Garrett's subsoil-plough is much approved; its work is considered superior to trenching by hand, inasmuch as the inferior soil is not brought up to the surface—a practice not generally to be recommended, except for orchards and plantations. A lighter kind of the Kentish Turn-wrist plough, drawn by two horses, is sometimes used in summer working—an instrument that might be very advantageously employed on the freer soils throughout the county. The cultivation of Mid-Kent may be described as being deep and clean: ploughing is thoroughly done from 7 to 9 inches in depth, and in high situations sometimes reaching the hard rock. The Kentish five-share drill is in general use, and is preferred to the Suffolk drill for its greater simplicity of construction; it is frequently used with three shares for drilling peas and beans, generally about 20 inches apart.

The planting of wood and the improvement of natural woods have been extensively gone into. Mr. Lewis, of Farleigh, has some prime plantations; as has also Mr. Rider, of Boughton-place. The favorite sorts are chesnut, ash, larch, willow (the plum-tree variety). These plantations will sell for 50*l.* or 60*l.* an acre every 10 or 12 years, when properly managed. The characteristic timber trees of the rag-stone are elm, which prefers a dry calcareous soil; but on the narrow formation of the Gault, lying

as already stated between the rag-stone and the chalk, which is of a stiff adhesive texture, the oak abounds.

III.—*The Weald.*

This extensive district occupies the southern portion of the county, lying immediately under the Rag-stone-hill. It may be divided geologically into two parts, the Weald clay and the Hastings sand: the former is a low, level tract, resting on a gravel, or, more generally, strong yellow clay subsoil; its natural drainage being the Eden, the Beult, and the Medway. It varies in width from 3 to 6 or 7 miles; and like all the other formations of this county, runs in the direction of east and west. The latter, or Hastings sand, consists of a series of alternations of sand, gravel, and clay, the surface being beautifully diversified and undulating. It occupies in this county about the same area as the Weald-clay valley, having the greatest width between Sandhurst and Biddenden. The whole of this district is densely wooded, and produces oak timber of large dimensions and of the best quality. This portion of the county was, no doubt, the last that was settled, it being originally, as its name denotes, a forest.

The soil in the Weald valley is pretty generally of a uniform quality, heavy and adhesive, except along the margin of streams, where a deeper soil obtains, resting frequently on gravel. The whole of this district would be immensely benefited by draining; but certain parts are so flat that a sufficient outfall cannot in some instances be obtained. The drainage of many portions of this level tract might be very much facilitated by improving the river Beult, by which an extensive area of country would be highly benefited. Hence the desirableness that the landowners of a whole district should unite for the promotion of a common object. That portion of the county resting on the Hastings-sand formation presents few difficulties of this nature, the surface being generally much broken and undulating.

One of the greatest improvements effected of late years throughout the Weald has been the making of better roads. Forty years ago a large portion of this entire district was destitute of hard roads; and, indeed, at a period much more recent the leading thoroughfares in many parishes were not passable but with the greatest difficulty, during one-half of the year. The old roads, a few of which yet remain, and serve as mementos of a by-gone age, were frequently of enormous widths, from 80 to 150 feet, and in wet weather they were made into a complete puddle by the poaching and cutting up of the clay by horses and waggons. A narrow path was usually made, and protected by stumps on one side, paved with stones or filled with sea-beach, for the accommodation of pedestrians and "pack-horses," upon whose backs alone agri-

cultural produce could be got to market during the winter months. An astonishing change, however, has been effected of late years; so that there are but few parts of England which now possess better roads than some portions of the Weald of Kent: and the same observation applies to the adjoining and analogous district of Sussex. These improvements have not been made without a very great outlay, the district being generally but sparingly supplied by nature with a good road material. Sea-beach is extensively employed within a distance of 8 or 10 miles of the Rother, where it is brought in barges from the coast. Other portions, lying nearer the Rag-stone-hill, have obtained an excellent road material from thence. Great exertions have been made of late years in parishes remote from either source of supply to obtain stone in their own localities, and in several instances with tolerable success. In speaking of roads we may further observe, that in those parts of the county already described, both the parish highways and turnpikes have generally been in excellent condition for a great number of years. The South-Eastern Railway, which runs through the Weald, has already conferred many advantages on this part of the county.

It is quite impracticable to give a correct general statement of the mode of cropping and cultivation that would apply to the whole of this district. It cannot be said that anything like system in these respects exists. The old practice, even now in some parts too much followed, was—1. A year's fallow; 2. Wheat, manured with lime; 3. Oats, or a little barley; 4. Seeds (clover, trefoil, and rye-grass). The seed ley was usually fed off one or perhaps two years, then a naked fallow, and the course returned. The introduction of late years of tares—now very extensively cultivated—swedes, turnips, mangold, and, within the last year or two, the white carrot, have made large inroads on the old system. About a century back marl was extensively and repeatedly applied as a manure for corn: hence it is common to observe large unsightly pits, now partially overrun with bushes and wood, in the middle of fields; some spirited farmers have been at great expense in filling them up of late. The heavy and repeated marling which this already adhesive soil formerly received, has, in some situations, injured its mechanical properties for ever. The marl of this district frequently contains *so much alumina* and *so little lime*, as to be utterly worthless as a fertiliser. Chalk-lime succeeded marl for a considerable period, but of late years lime has been much more sparingly used; it was found not to repay the cost on stale arable land that had been repeatedly dressed with it; consequently other kinds of manures have been sought after.

The only stone found in the Weald containing a sufficient percentage of lime to pay for burning occurs principally at Bethersden;

it consists of an accumulation of fresh-water shells—chiefly of the genus *Paludina*—with *Cypris Faba*, and admits of a fine polish. It is sometimes used for ornamental purposes, such as chimney-pieces, &c. The whole of this district is supposed by geologists to have once formed the bed of an extensive lake, or the estuary of a mighty river. The Bethersden lime is now but rarely if at all employed: it being of a heavy nature, its application was less beneficial on clay land than chalk lime.

Amongst improvers of Weald-clay land, Mr. Schreiber, of Henhurst Lodge, may be honourably mentioned. The estate, when he took it into his own hands, nearly twenty years ago, was in the worst possible condition, yielding scarcely any rent. But by making larger enclosures, thinning hedges, removing trees, together with thorough draining, an extraordinary change both in the appearance and productive powers of the land has been produced—an example of what capital, skill, and enterprise may achieve on the stubborn and unproductive soils of the country. Such improvements, too, when sustained with energy, are fraught with benefits not only to the country generally but especially to the neighbourhoods in which they are conducted, by affording increased employment to the labouring poor. The subsoil on Mr. Schreiber's estate, like that of a considerable portion of the Weald, is a stiff yellow clay, frequently approaching to within five or six inches of the surface. The draining has been accomplished on Pearson's system; all three furrows, to the depth of 22 inches, were thrown out by the plough, and the clay rammed down on a moveable slide formed the drain.*

The course of cropping on Mr. Schreiber's farms is mostly—1. Clean fallow; 2. Wheat; 3. Oats; 4. Seeds; 5. Seed-ley, fed off by cattle or sheep; 6. Beans or peas; 7. Tares; turnips, &c., as preparatory for wheat again. Averages:—wheat, $3\frac{1}{2}$ qrs. (of excellent quality); oats, 5 to 6 qrs.; beans, $4\frac{1}{2}$ qrs.; peas, $3\frac{1}{2}$ qrs. per acre. It is important to mention here that when Mr. Schreiber commenced his improvements he brought with him most of the approved modern implements of the eastern counties, which, after repeated trials and untiring perseverance, he has by degrees almost abandoned, and has adopted the implements and modes of culture common to the district. This fact leads us to remark, whatever theorists may say to the contrary, how important it is that a man should practically understand the nature of his soil

* See a pamphlet entitled 'The Uses and Advantages of Pearson's Draining Plough,' by T. L. Hodges, Esq., London, Ridgway. This mode of draining is best adapted to large fields, and upon uniform clays only. It is best performed in the wettest weather in winter when upon such soils there is little or no employment for teams, and the expense, 24 inches deep, for manual labour only, does not exceed 1d. per rod.

before he steps very far out of the beaten path of cultivation. It is generally found that those who have been brought up to farming in the Weald succeed much better than strangers. Ransome's Essex swing-plough, however, drawn by two horses abreast, is sometimes employed on the heavy soils of this district for summer working: and in favourable seasons might, I think, be generally adopted with advantage in most parts of the county.

In speaking of agricultural improvement, it is but right to mention Mr. Thomas Paine Hilder, of Kingsworth, who occupies a farm consisting of upwards of 500 acres, belonging to the Haberdashers' Company. The soil is superior to the Weald clay, occupying the margin of that and the green-sand formation. The debris, or admixture of two formations, may be observed in many localities of this county as forming the most productive soils for general purposes; and this circumstance will in some measure account for the peculiar fertility and range of crops of Mid-Kent. Mr. Hilder's farm lies mostly on low ground adjacent to the eastern branch of the Stour. When he took possession of it about twelve years since much of it had been subjected to inundation during the winter; it consisted of small enclosures, with wide bush hedges (called in this county *outrunnings*), unsightly pollards, and was comparatively worthless. By grubbing old hedges and pollards, and by cutting sewers and drains, the land has been changed from a wilderness into a highly valuable and productive farm. From a literal swamp, draining has brought it to a state of perfect dryness, even to bear the tread of cattle without injury in winter. Upwards of three miles of open water-course have been cut from 9 to 20 feet wide and 5 to 6 feet deep, for out-fall. Most of the land has been drained with tiles $3\frac{1}{2}$ feet deep, and from $2\frac{1}{2}$ to 3 rods asunder. Upwards of 20 acres occupied by hedges have been grubbed, deep ditches everywhere cut, with fields averaging 20 acres each—formerly only 6 or 7. There is a prime plantation of hops, comprising 60 acres, on land a few years since almost worthless. There are at least 2000 acres adjoining of excellent soil, which admit of equal improvement by the same means. The soil, when dry, is a loose and porous mould, from 1 to $2\frac{1}{2}$ feet deep, below which a stiff substratum is reached. The rotation which Mr. Hilder adopts is the four-field course,—1. Tares; 2. Wheat; 3. Clover; 4. Oats. In the next rotation half after oats is devoted to beans and peas, instead of tares, as preparatory for wheat: a portion of turnips is likewise introduced. Rents of the district, about 20s.; rates, 2s. 6d.; tithes, 5s. per acre, *exclusive* of hops, which are 15s.

Within the last few years the management and cropping of land in the Weald have undergone a material change, partly in consequence of the general extension of draining, which, with the

culture of crops in rows, has in great measure obviated the necessity of naked fallows. On the better lands lying in the valley of the Beult the following course is frequent, but with numerous variations, according to difference of soils, seasons, &c.:—1. Beans or peas; 2. Wheat; 3. Oats; 4. Tares; 5. Wheat; 6. Clover. Wheat is generally manured with lime, rags, or artificials. Mr. Barnes of Staplehurst has employed guano and the nitrates of potash and soda with marked success as dressings for corn-crops.

The average of this district may be called—wheat, 3 to 3½ qrs.; beans, 4 qrs.; peas, 3 qrs.; oats, 5 to 6 qrs. The most approved varieties of wheat are the *Chevalier*, *Golden Drop*, *Duke William*, *Peacock White*; of oats, the *Poland*, with the *black and white Tartar*; beans, the *Middle Tick*, generally drilled or dibbled. The soil is not adapted for the growth of malting barley.

In some localities on the Hastings sand formation wheat is brought round more frequently—in some few cases every alternate year. We think, however, that this practice cannot be long maintained in soils not naturally rich without an extraordinary and frequently unprofitable application of manure. When tares alternate with wheat, folded with sheep, and the ground is kept clean, its fertility may remain for a time unimpaired. On the second-rate soils especially, experience has decided an extended rotation to be preferable. Mr. Francis Ayerst of Hawkhurst has adopted for many years the undermentioned course, which seems well adapted to the district:—1. Fallow; 2. Wheat; 3. Beans, peas, or turnips; 4. Oats; 5. Tares; 6. Wheat; 7. Seeds; 8. Oats. In this course the naked fallow occurs only once in eight years, and if the land is clean, early turnips, &c., might be substituted. Clover coming round, at long intervals has been found not to fail. On some of the turnip soils in the county, that valuable root, in consequence of its long cultivation and frequent repetition, is found not so productive as formerly. Chemistry may ultimately find a remedy for this phenomenon; but with our present imperfect knowledge it is safer to keep as close as possible to the paths of extended observation and experience. The observance of this simple rule in farming would frequently prevent many a disappointment and failure.

Hops are extensively cultivated in the Weald, particularly in the iron-sand district. In the clay valley their culture has of late years much extended, owing no doubt to the better drainage of the land. The two principal varieties are the "*Grape*" and "*Jones's*," but "*Colgate's*" have of late increased. The two latter are considered hardy sorts, and when allowed to get perfectly ripe before they are picked, a matter not always sufficiently regarded, they make an excellent sample. Hops are planted on hills from 6 to 7 feet asunder, either square or triangular; the latter form

more freely admits of cultivation, light, and air—essential conditions of healthy vegetation. From ten to twelve hundred hills will stand on an acre. Poles vary in length from 10 to 16 feet, according to the soil, age of the plant, and variety of hop. In Mid-Kent poles of still greater lengths are sometimes employed. Two, three, and sometimes four poles are put to a hill—three being the most general, in a triangular form. The price of hop-poles varies considerably, according to situation and kinds of wood. Chestnut, ash, and larch are the most esteemed sorts, particularly the former. Beech, birch, and alder are the worst. The *mean* price may be somewhat as under:—Poles 10 and 11 feet long, 8s.; 12 feet, 13s.; 14 feet, 21s.; 16 feet, 30s. to 35s. per hundred. I saw last spring a hop-garden in Mid-Kent poled with three new 16-foot chestnut poles to the hill, at a cost of 42s. per hundred, exclusive of ten miles' land carriage. The first cost for poles only would therefore amount to upwards of 60% an acre! As soon as the young bines attain a sufficient length they are tied to the poles with rushes, an operation performed by women and children. The very strong and forward bines are usually rejected, not being considered fruitful. The cultivation of the ground, both by horse and hand labour, is almost incessant during the period of growth. Horse-hoes (provincially called nidgetts or shims), with from 7 to 12 long iron tines, are drawn by one or two horses up and down the "alleys" in each direction. The deep and frequent moving of the earth by these means, and by chopping round the hills with hoes, not only prevents the growth of annual weeds, but by opening the soil to the influence of heat, air, and moisture, the manure is reduced into a soluble state and brought into contact with the expanding fibres of the roots. A well managed hop-ground presents nothing short of perfect garden culture. This crop is peculiarly subject to blights, arising from extreme seasons, or more commonly from insects, particularly aphides, which sometimes increase in such prodigious numbers on the leaves of the plant as to exhaust all its vegetable juices and blast the brightest hopes and prospects of the cultivator. The "*mould*" is a disease of the nature of a fungus or parasite, and is more common to the finer varieties cultivated in Mid-Kent: of its causes and nature very little is known with certainty, and the means of prevention is a matter involved in even greater obscurity. Its destruction of the crop, however, is frequently complete, preventing the development of the hops, which are of the size and hardness of peas, devoid of all aroma, or "condition," whatever.

The expense of cultivating hops varies very considerably, but in all cases it must amount to a large sum. It should be observed that the amount of produce does not invariably depend on the state of cultivation, since it frequently happens, in blighting years,

that the best manured and cultivated grounds fare the worst. The plants being more vigorous, and having a continued supply of nourishment, are enabled to sustain till a late period of the season a series of new and increasing generations of insects, whereas on more feeble plants, when early attacked, the insects die off soon in consequence of an exhaustion of food, and then, should the weather prove favourable, such plants may recover and produce a small crop. I have submitted to several experienced planters the following estimate of the cost of raising and cultivating an acre of hops in the Weald of Kent, presuming the plantation to be in its full vigour, and the cultivation liberal.

1. Raising the plantation:—

	£.	s.	d.	£.	s.	d.
Ploughing and subsoiling	1	10	0			
Harrowing	0	5	0			
Manure—50 loads of dung, at 2s.	5	0	0			
Setting out hills	0	2	6			
Digging holes, and filling up with manure	1	5	0			
Plants, 5000 at 6d. per hundred	1	5	0			
Planting	0	8	0			
Expenses of planting				9	15	6
Shimming, or horse-hoeing, 5 times	1	5	0			
Four-foot poles, one to each hill, and labour	0	5	0			
Chopping round the hills, at 8d. per hundred	0	6	8			
Striking furrows and shovelling	0	3	4			
Draining, 240 rods, at 9d.	9	0	0			
Rent, taxes, and tithe	2	0	0			
Total expense, first year				22	15	6

2. Cost of cultivation from the *second* to the *sixth* year, both inclusive:—

Striking up and furrowing	0	5	0
Stripping and stacking poles	0	6	6
Digging, at 21d. per hundred	0	17	6
Manure, carting on, &c.	8	0	0
Dressing (pruning), at 6d. per hundred	0	5	0
Sharpening poles and poling, 1s. 6d. per hundred	0	15	0
Tying, at 10d. per hundred	0	8	4
Ladder tying	0	3	0
Chopping, at 9d. per hundred	0	7	6
Shimming (horse-hoeing) 5 times, rolling, &c.	1	5	0
Hilling, at 3d. per hundred	0	2	6
Setting up poles, and incidental expenses	0	3	0
Poles, carting on, &c.	8	10	0
Rent and repairs to coast	1	5	0
Rent, rates, and tithe	2	10	0
Interest on capital, 30% per acre	1	10	0
Cost of cultivation per annum			

26 13 4

	£.	s.	d.	£.	s.	d.
Cost of cultivation per annum	.	.	.	26	13	4
Estimated growth, 10 cwt. per acre.						
Picking.	.	.	.	5	0	0
Drying, packing, &c.	.	.	.	3	10	0
Duty	.	.	.	8	14	6
				17	4	6
Total cost per annum	.	.	.	£43	17	10

The above calculation will probably somewhat exceed the actual cost per acre of an entire plantation, consisting of several gardens of different ages and strength, as in such case the poles would be thoroughly worn out, and a few other expenses diminished. It must nevertheless be considered as a *fair average* of the class of hops to which it relates. In Mid-Kent the cost per acre is several pounds higher. The Mid-Kent hops, however, consist mostly of the finer sorts, and will command from 15 to 25 per cent. higher prices than those of the Weald; the duty in each case being precisely the same. It must be observed that there is no crop the first year, and that the second is generally but trifling. I have added nothing for interest on the original cost of rearing the plantation, since draining is a permanent improvement, and hop-gardens when grubbed are in a much improved condition for every purpose of cultivation.

The following is a summary of the produce, &c., of a hop-plantation in the Weald of Kent for ten years. The plantation may be considered quite an average for the district, either as it relates to the suitability of the soil, the state of cultivation, or the prices obtained.

Years.	Acres.	Growth.	Sold for.	Average per Acre.
		Cwts. qrs. lbs.	£. s. d.	Cwts. qrs. lbs.
1835	27½	315 0 0	*1,148 5 0	11 1 23
1836	30	245 0 0	801 11 2	8 0 18
1837	28	207 0 0	727 10 0	7 1 16
1838	25½	298 2 0	1,202 0 3	11 2 23
1839	21½	329 0 4	939 16 0	15 1 6
1840	22½	14 1 17	79 3 6	0 2 15
1841	22½	223 0 11	1,316 0 7	9 3 18
1842	22½	228 3 6	962 14 6	10 0 19
1843	25½	274 0 0	1,523 3 3	10 3 0
1844	25½	78 2 23	549 9 3	3 0 9
		2,213 2 5	9,249 13 6	8 3 7

Average value per acre for 10 years . . . £36 17 0

Average value per cwt., after deducting expenses
of carriage and commission . . . 4 3 6

The price per cwt. ranged between 48s. and 150s. in the above case during the ten years.

In this statement neither the duty nor the expenses of picking, drying, &c., have been charged—a sum usually computed at 35l. a ton, or 1l. 15s. per cwt.

The duty on hops has been 18s. 8d. per cwt., to which an additional 5 per cent. was recently added. The number of acres cultivated for hops in the county of Kent in 1844 was 22,475, being one-half of the entire plantation of the kingdom. From the expensive cultivation, the precariousness of the crop, and the low prices which have ruled of late years, the business of hop-growing affords upon the whole no profit adequate to the risk, and it is attended in not a few instances with positive loss. Hop growing, however, is a speculation in which a few occasionally realise immense profits, the hope of obtaining which induces the many to persevere. It is indeed a lottery, in which the blanks are too commonly found disproportionate to the prizes. Hops are unlike every other species of agricultural produce, in that there is sometimes a danger of growing *too much*. In years of very great abundance the price is so low as scarcely to meet the duty and the expense of picking and drying. The chief hope of the planter's obtaining a remunerating price is the chance that the crop in some other districts save that of his own may more or less fail. It should also be observed that the cultivation of hops too frequently receives such exclusive attention as to act most injuriously on all the other crops. It is no uncommon thing to see—particularly on the smaller farms of the Weald—the small portion devoted to the growth of hops highly manured and cultivated, while the rest of the land is suffered, year after year, to remain in a foul and exhausted condition. No wonder that, under such management, both corn and cattle should deteriorate. I need not say that such is not the case upon all hop-farms; many of which, as regards skilful and liberal cultivation, leave little or nothing to be desired. But I think that the sooner that hop-culture is allowed to occupy only a subordinate place in the extended husbandry of Kent, the better will it be for the advancement of its agriculture and general prosperity. It should be borne in mind, however, that on a hop farm a large fixed capital exists in buildings and underwood, which, in case hop-culture were abandoned, would become almost valueless.

Hops are dried and prepared for market in buildings erected for the purpose, called "*Oasts*." It would require an independent treatise to go into full descriptions and specifications of "*oasts*," and the particulars of hop-drying; in this place, therefore, a few general remarks must suffice. Many changes of late years have been made in the construction of these buildings. Mr. John Read, the inventor of the stomach-pump, was among the

first to apply scientific principles to the art of hop-drying. The principal object to be aimed at is to procure and apply heat in the readiest and most economical manner. The most general and approved form of "oasts" now in use is the "cone," that is, a circular kiln of brickwork, from 15 to 18 feet diameter, with rafters 24 to 27 feet long, leaving a round opening in the apex of the roof, surmounted by a moveable "cowl," the object of which is to allow the vapour arising from the drying hops freely to escape. The drying-floor should be at least 10 or 12 feet from the fires; it is usually made of stout laths of fir, about 2 inches apart, covered with a horse-hair cloth, upon which the hops are evenly spread. The improved modern practice consists in having one or more large fires and openings to one kiln, and to admit plenty of cool air from without, the draft being regulated by means of flues and sliding doors. The fuel used in drying hops is in all cases charcoal or coke, with some anthracite (Welsh) coal. In "cockle" oasts, however, common bituminous coal is employed, since the furnace is connected with a chimney for the escape of smoke. Mr. S. J. Knight, of the Waterside Foundry, Maidstone, has recently introduced some important changes in the mode of drying hops, by means of heated air tubes, &c. His "Patent Hop and Malt Kiln" is a powerful apparatus, and from the success which has attended its partial introduction, and the attention which Mr. Knight continues to bestow on its further improvement, there is reason to hope that this invention will ultimately be found of general benefit and application. The recent introduction of the packing-machine, by means of which hops can with facility be packed warm, will be of advantage in superseding the necessity of large cooling-rooms. The greatest possible care is required both in the picking and curing of hops; the least neglect in the latter department frequently occasions serious loss. The whole process of drying, packing, &c., is under the strictest superintendence of the Excise.

In consequence of the constant and increasing demand for hop-poles and fire-wood generally, the management of wood-land forms an important feature in the rural economy of this county, more particularly in the hop districts. Increasing attention is accordingly paid to this department, and there are but few estates, great or small, on which the wood-land is not now more productive than formerly, although very much yet remains to be accomplished. On the Hemsted estate particularly, the property of Mr. Hodges, the improvement of wood-lands has been very extensively and successfully carried on for the last thirty years. Within that period, some woods I remember on that estate which were not worth a rent of 5s. an acre will now realise at

every felling of ten years' growth from 40*l.* to 45*l.* per acre! Much might be said on this important subject; but I shall introduce some valuable remarks and calculations with which I have been favoured by a gentleman of long and extensive experience in the management of estates in this county, and who was among the first to form larch plantations on exhausted arable land in this district, for the double purpose of growing hop-poles and renovating the soil:—

“The woodlands in this county have, generally speaking, been very much improved within the last 30 years by draining and planting, particularly in and near the hop-growing districts. The system pursued on some estates, after sufficiently draining the surface by open ditches, is to fill up all vacancies in old wood-lands with chesnut or ash plants, according to the nature of the soil, at distances of not less than 6 feet from each other, but at considerably less than that from old and inferior stubs or stools. This planting is done in the course of the autumn or winter next succeeding the season of felling. At the following felling of the wood, say in 10 years, the young plants are cut off at least 6 inches from the surface of the ground; some of the most inferior and least productive of the old stubs of beech, birch, &c., are then grubbed up to give room for the young plants, and the vacancies occasioned thereby are filled up as before. At the next felling of the underwood, at the end of 8 or 9 years, the remainder of the old stubs are grubbed, and the ground filled up with plants as before, taking care to have all the plants at least 6 feet apart. I know of wood-land treated in this way that has improved in value from six to tenfold within 25 years.

“It is a great and fatal mistake which almost all young and inexperienced planters make, to plant too thickly, and not unfrequently to put in ash or willow on a soil suitable only for chesnut. Willow, if planted at all, should only be put in very sparingly, ash being so much more durable and valuable.

“The advantage of this method of gradually improving wood-land is, the expense is not very serious, and the produce is not at any one time diminished, as of course it would be if all the old stubs were eradicated at once and the ground entirely replanted. The value of the stubs pays the expense of grubbing.

“New plantations to some considerable extent have during the last 20 years been made of chesnut at 6 feet distance, with larch in the intervals at 2 feet distant each way. Some of the larch are large enough for hop-poles in 9 or 10 years from the time of planting, and should then be taken up to make room for the smaller plants. The whole of the larch cannot be taken down with advantage till the 7 or 8 succeeding years, when the chesnut are left as a permanent plantation.

“The following is an estimate of the cost per acre of making a plantation of chesnut and larch, viz.:—

* Mr. Thomas Neve, Pullington, Benenden, whose larch plantations are in a flourishing condition, having supplied the neighbourhood with many thousand hop-poles annually for a considerable period.

	£.	s.	d.
"Trenching 2 spits deep	6	0	0
1200 chesnut plants	4	4	0
12,000 larch plants	5	0	0
Labour of planting	2	10	0
Some plants are generally destroyed by drought, or hares and rabbits: replacing them, say for the			
first 3 years	2	0	0
Hoeing and cultivation for 3 years	3	0	0

"To these items must be added rent, taxes, and interest on capital, which in 10 years will bring the expenses up to at least 50*l.* per acre, and in some instances to considerably more. The produce, however, generally well repays this outlay.

"On stiff clay soils suitable for the growth of ash, it is not advisable to plant larch. The ground should be trenched, and, after being planted, should be kept perfectly clean by digging, horse-hoeing, &c., until it can be covered with hop-bines, which promote the growth of the plants in an extraordinary degree. It is found to be very beneficial to lightly dig old plantations the same winter the wood is felled; by that means the grass and weeds which would otherwise spring up are checked, until the young shoots overspread the ground and smother the weeds."

The breeds of cattle in the Weald are various, but the "*Sussex*" predominate; a considerable number of which are annually reared. This breed is of a red colour, frequently a dark red, of a hardy constitution, and when well kept arrives at a large size. Sufficient pains and attention have not been generally bestowed on the breeding of this variety of stock; where that has been done, very superior animals have been reared; and with moderate keeping and feeding they have evinced a tendency to early growth and maturity, together with an improved symmetry of form. Mr. S. Selmes, of Beckley, Sussex, stands highly distinguished for his superior stock, having devoted an untiring attention to that object through a long life. Mr. R. Turley, of Rolvenden, in this county, may also be instanced as a successful improver of this breed. They are excellent workers, and are still employed in many places for that purpose in the Wealds of Kent and Sussex. Steers are generally fatted at 3 years old with oil-cake, turnips, and hay, either put into small yards, or tied up in pens or sheds; when well fed they will weigh from 95 to 120 stone. The chief recommendation of the *Sussex* breed is that they possess a hardy constitution, are good workers, and when well fed are much liked by the butcher, affording a large quantity of fat and excellent meat. As to early maturity and other important points, they are decidedly inferior to the improved modern breeds; a fact sufficiently indicated by their having been confined so many years within a very narrow district. So valuable is fattening yard manure that hop-

planters are induced to fatten for the sake of the dung, when perhaps there is no prospect of a profit on the cattle being realised.

The implements employed in this district have undergone in some instances considerable improvement of late years; and a few new ones have been introduced. The Kentish turn-wrist wheel-plough is frequently used for summer working; but the implement generally employed, especially for winter ploughing, is the Sussex turn-wrist foot-plough, an instrument upon the whole the best adapted to this locality. Wheat land is usually laid up in ten or twelve furrow ridges of a convex form; and the double furrow-plough, drawn by four horses singly, is sometimes employed for this purpose, and in favourable seasons it succeeds well. The "Cultivator," consisting of a straight, stout iron tram, into which are fitted seven long tines, the whole connected with the axle of a pair of cart wheels, is a very powerful instrument, requiring five or six strong horses, and sometimes more, thoroughly moving the ground to the depth of 10 or 12 inches, and bringing to the surface the roots of all weeds, has of late years been extensively employed. It is frequently used with a set of broad-share tines on the stubbles in autumn, a modern practice highly beneficial, and forms an excellent tilth for winter tares. I consider this instrument to have some mechanical disadvantages, and upon the whole to be much inferior to the Uley cultivator or Finlayson's harrow. Drilling is gradually extending, as is also the cultivation of swedes, turnips, mangold, and carrots, heavy crops of which are frequently grown.

Draining is the foundation of all agricultural improvement on the wet heavy lands of the Weald; indeed, even the lighter sandy soils of this district are frequently wet and springy, and are immensely benefited by draining. Hitherto the cost of this operation has prevented its general adoption. This district affording no stone, wood and bushes have been frequently employed as materials for draining, but being of so perishable a nature a permanent material at a moderate cost was the great desideratum. Mechanical science has, however, recently come to the aid of the farmer, and by means of improved machinery these important agents of ameliorating the land have been very much reduced in price. One of the latest, and I think upon the whole the most valuable improvement, originated and has been successfully applied in this district, I refer to "*Hatcher's Benenden Tile Machine*," an instrument of simple construction, therefore not liable to get out of order, easily movable from one place to another, and with a small amount of manual labour possessing a great power of production. The public is deeply indebted to Mr. Hodges, of Hemsted Place, for his liberality and indefatigable exertions in

assisting the inventor to mature his discovery and bring it into practical operation.* It would appear that on any estate requiring draining and possessing a suitable clay for making tiles or pipes, a temporary tilery might be erected adequate to all common wants, including the purchase of machine, pug-mill, &c., for the small sum of fifty pounds! The discovery of so cheap and expeditious a means of manufacturing *that upon which the further advancement of agriculture in the cold clay districts of Britain essentially depends*, cannot fail to confer upon this nation unspeakable advantages.

Before, however, draining can be successfully carried out in the Weald and other enclosed portions of the county, the small fields must be enlarged by grubbing hedges and felling trees. Not less, perhaps, than an *eighth* of the entire area of the arable land of this extensive district is occupied by hedges and trees, taking into calculation the ground that is injured by their roots and shade. Many of the fields consist of only three or four acres: the mere mechanical disadvantages, therefore, of cultivation are obvious, especially when it is considered that upon this heavy soil four horses are usually worked at length in ploughing. The corn too near the hedges is always of a very inferior quality as well as deficient in quantity, being much injured by birds and lodged by wind. In showery harvests it is always sure to be damaged by sprouting, and is frequently worthless. In small fields a large proportion of the ground consists of headlands, which on an adhesive soil in wet seasons are made into a perfect puddle by the turning of the horses employed in the various processes of cultivation, the ground thus becoming useless. "*Lost fallows*," as they are aptly termed, not unfrequently occur in wet autumns in small enclosed fields, where light and air are in a measure shut out, and the important process of evaporation is as a consequence greatly impeded. Thus nearly a whole year's expenses, and perhaps a dressing of manure, are almost lost. There are many thousands of acres in the Weald of Kent which cannot under existing circumstances be cultivated without a positive loss, that might be made to yield of most kinds of corn a full average of the kingdom. It is a mistake to suppose that this portion of the county is in itself so much inferior to the rest in the natural productiveness of its soil. Its stately timber trees and productive wood-lands afford demonstrative proof of the capabilities of the soil. All that is required is to allow free access of light and air, in connexion with an effective system of cultivation and drainage. Enough has already been

* For particulars, see Mr. Hodges's paper "*On the cheapest method of Making and Burning Draining Tiles*," in the current number of the Society's Journal, vol. v., p. 551. I regret to add, that since that paper was written the inventor of the machine is no more.

done within the last dozen years to place beyond doubt that the Weald of Kent is susceptible of an immense and profitable improvement.

It must not, however, be supposed that this portion of the county can ever be made a strictly open district, since nature has designed it otherwise. There are extensive woods and narrow ravines running in all directions, where coppice and timber ought to be preserved. Here the oak frequently attains a great size, owing to its sheltered situation; and a large produce is every ten or twelve years yielded of hop-poles, faggots, &c., in such spots as are free from timber. *The fatal mistake characteristic of the district is to allow high wood and trees to grow in the hedges of arable land in small enclosures.* Besides, hedge-row timber, from its exposed situation, is generally short and of stunted growth, consisting principally of boughs, and therefore of but little value in the market. It is common to see very inferior trees do more injury in three or four years to the crops than the whole value of the trees will amount to after continuing the mischief for half a century!

The produce of the hedge-rows consisting of timber and roots, would, after paying the expenses of grubbing, levelling, &c., go a great way in defraying the cost of thoroughly draining the whole of the Weald. In some situations it would be more than adequate. The district therefore possesses within itself *the means of its own amelioration.* All that is required is to go about the business in a judicious manner. The Weald of Kent cannot be cleared up and drained in a year. Even if it could it would not be desirable. Haste is not always sound progress. There is now a dense population in this district owing to the increasing hop-culture, a large portion of whom were in former years frequently thrown upon the rates in the winter months. By following out a comprehensive system of *progressive* improvement, every hand in the district for an indefinite time to come might be profitably employed *throughout the year.* The cheapest and most effective way of carrying out this great object would be for the owners of land to commence their operations *systematically*, and to do nothing by piece-meal. Whatever is done should be done thoroughly, and not interfere with any improvement to be subsequently effected. It would be well for every estate to be annually looked over with great care, with reference to permanent improvement, and to commence with what is most needed. The best way, perhaps, would be for the landlord to pay the whole expense of the draining, conducting it under his own superintendence, and to charge a fair per centage on the rental. A judicious outlay might be made to yield in many parts of this county five or six per cent., with a very great advantage to the occupying tenant.

Draining has been more or less carried on in this district for the last thirty years, particularly in hop grounds; and there is no part of the kingdom in which better workmen can be found in this very important department of rural labour than in the Weald of Kent. The great error hitherto has been not laying the drains sufficiently deep, and constructing them of a perishable material. There is now an increasing disposition to drain deeper, and tiles or pipes, in consequence of their reduced price, are generally employed. On stiff clays drains should be laid from 3 to 4 feet deep, and varying in distance, according to circumstances, from 20 to 30 feet. For hops on such soils, drains ought not to be more than 12 or at most 18 feet asunder. In soils alternating with clay, sand, gravel, &c., which is the case with a large portion of the Hastings sand formation, draining cannot well be done too deep, and I prefer taking the drains directly up the slope of the field, thereby cutting through all the underlying strata. From 100 to 200 rods of drain per acre would, if properly executed, be found sufficient. The cost of labour would of course greatly vary according to soil and depth. In soils free from stones, drains might be made from 3 to 4 feet deep for 4*d.* to 6*d.* a rod, to which the price of pipes, of 1 to 2 inches diameter, being added, would make the cost vary from 7*d.* to 10*d.* per rod. This calculation, however, supposes that all circumstances are favourable. In many situations draining must be more expensive; in all it must be a costly operation. From the laborious and unpleasant nature of the work and the season when it is generally performed, a good workman ought to earn at the least half-a-crown a day. It should be remembered that by exposure to wet and cold during the severest weather of winter he runs a great risk of illness; and I have known many instances of chronic complaints being induced by this exposure. I have often thought that some suitable waterproof garment might be manufactured to meet the peculiar wants of the drainer.

Farms in the Weald of Kent are commonly small, as compared with other parts of the county; many holdings not exceeding 50 acres, and several much less. Some of the smallest lots have within the last forty years been added to larger farms adjoining, the expenses of keeping up separate buildings being too disproportionate to the rent. Rents vary from 8*s.* to 18*s.* per acre; but on small estates they are generally higher. Rates, from 5*s.* to 6*s.*; tithes, from 3*s.* to 7*s.* per acre. Wood-land in the Weald is tithe free. In those parishes which were not under a modus, there is an extraordinary tithe on hops of about 20*s.* per acre. In this part of the county there is still a large number of small freeholds occupied by their owners; but the majority of tenants hold on yearly tenures. Yet on many of the large estates particularly, we

find farms descending from father to son, and in some cases through several generations: permanent and expensive improvements made, at the occupier's cost, affording a pleasing illustration of the existence of mutual respect and confidence between landlord and tenant. I am not aware that there exists in the county any strong general desire for leases. Yet it must be acknowledged that an improving tenant ought to have secured to him the benefits of his improvements. The best guarantee, perhaps, of such security is a *moral bond*, formed by the cultivation of mutual good-will between a just landlord and an enterprising tenant. It is not meant here to insinuate that a legal document is not needed in certain cases, particularly where farms are held under small owners or land speculators. In such cases a tenant who undertakes expensive improvements ought to be protected by a long lease. But I fear there is a tendency in the present day to look for too much from mere legal arrangements, apart from those higher considerations of a moral nature so essential to social welfare and progression.

On the eastern side of the Weald, bounded by the English Channel, occurs the rich and extensive grazing district of Romney Marsh. This is a level tract of land, originally reclaimed from the sea, and still protected from the inroads of the waves by an artificial embankment, upwards of 3 miles in length, between New Romney and Hythe. The annual expense of keeping in repair this "wall" is very great, and is defrayed by rates termed "Scots," levied upon all land in the marsh. These charges, however, have of late years been considerably diminished, while the drainage has been greatly improved, and the "wall," by employing stones instead of faggots, has a much stronger and more durable character. Walland and Denge Marsh, belonging to the same level, are not subject to the charge of keeping up Dymchurch Wall, each paying its own expense for its respective drainage. The whole of this marsh situated in Kent is nearly 12 miles long and about 8 in its greatest width, containing 44,000 acres.

The soil is far from being uniform, either as regards its mechanical composition or its powers of fertility. A large portion of the border adjoining the uplands is stiff and heavy, and frequently wet; while the parts adjacent to the coast are commonly light and sandy—often poor, and the pasture liable to burn during the drought of summer. There are many hundred acres on the coast consisting principally of beach and sand that are almost worthless. A pretty considerable portion of land in certain parts of the marsh has been for many years in arable culture; and there is reason to expect, when the commutation for tithes shall be finally settled, and should now continue to maintain a tolerable price, that a large breadth of land at present in the state of poor

and comparatively unproductive pasture will be broken up. The principal portion of the arable land lies nearly central in and about Ivychurch and Newchurch. Here also the soil is very various, changing within small distances from a heavy clay to a sand or gravel. The mould, however, is in general happily constituted for the purposes of culture, to a depth of from one to upwards of two feet. The subsoil frequently consists of alternating strata of clay, sand, and gravel. Springs of pretty good water at moderate depths occur in some parts; but as a whole the marsh must be considered deficient in this first essential element of life. Most of the stiff land, both arable and pasture, would be improved by draining. Where this means of improvement has been employed the drains have been usually made 3 feet deep on arable, and from 20 to 30 inches on pasture land; in the latter case the sod has been commonly used, and has been found to be efficient for at least a dozen years. In clay subsoils on arable land, straw, wood, and bushes have been employed, but these materials are necessarily perishable; and tiles, since they have been lowered in cost, have been pretty generally introduced. The general price for labour only in making drains of 3 feet depth is 4*d.* a rod. A large portion of the marsh does not require this mode of improvement.

The implements in general use are those common to the county, and heretofore described. Much of the land being of heavy cultivation, 4 horses are usually employed in ploughing, depth from 6 to 7 inches, and three-quarters of an acre in winter is considered a good day's work. Drilling and hand-hoeing are universal; still the ground is peculiarly liable to the growth of weeds, the great pest of marsh husbandry. On some farms cropping has been incessant for many years, the straw sold off, and little or no manure applied. This system cannot be carried on for a series of years without lowering the standard of fertility even of the richest alluvial soils, and accordingly this result is to be seen in those lands that have been subjected to such treatment in Romney Marsh.

The system of cropping is beans or peas and wheat every alternate year, substituting occasionally oats and turnips. The latter are generally drawn and carted off the field, either for the consumption of cattle in yards or sold off, the soil not being generally adapted for folding. The most commonly approved varieties of wheat are the *Salmon* and *Rattling Jack* as red wheats, while for white there are the *New Hoary* and *Spencer*, with several other sorts more or less cultivated. Wheat produces on this soil straw disproportionate to grain, which is not of the best quality: average, from 4 to 5 qrs. per acre. Of barley very little is grown, and not many oats. The most common and productive sorts of the latter are the *Poland*, *Potato*, and the *Scotch*: average 7 or

8 qrs. per acre. Beans, chiefly *Mazagans*, drilled in rows from 20 to 22 inches apart, will average 4 to 5 qrs. per acre. Large quantities of turnip-seed are raised: the crop, though very precarious—from 2 to 6 qrs. per acre—will sometimes yield a large profit. Mangold and radish seeds are grown to some extent, which, with turnip-seed, are generally sold by contract to London seedsmen.

Romney Marsh stands celebrated for the immense number of sheep which are bred and fattened there. The pasture-land likewise differs exceedingly in point of quality and productiveness. It may be divided into two kinds, breeding and fattening land. The former will keep, according to its condition, from 2 to 3 ewes per acre during winter, and about twice that number in summer. The fattening land is very various in its quality, but a fair average may be said to carry and fatten 4 or 5 sheep per acre, although there are instances of much greater numbers being kept. There is some rich soil, denominated "*quick land*," from the very rapid growth of the grass in favourable weather in summer. This land requires careful watching, lest the grass grow away too fast from the sheep, a circumstance injurious to the pasture. In such case the usual practice is either to buy in a sufficient quantity of cattle, or to take whatever can be got to keep on hire. But very few cattle are bred in the marsh, and they occupy in all respects a very subordinate place to sheep in its management. Large numbers, however, are sent down every summer by breeders from the Weald, either to be kept in a thriving condition as lean stock, or to be fattened. Although the breed of sheep in this marsh falls very short of perfection, and in some important points may fairly be considered inferior to the improved Leicesters and Oxfords, yet they possess a hardy constitution, well suited to their exposed situation, and under good management attain a large size, and produce a heavy fleece of long fine wool of the first combing quality. It should be observed, that they are fed upon grass only; a few turnips or a little hay being given but in the severest weather.

The greatest disadvantage which the flock-masters of Romney Marsh experience is the necessity of sending their lambs long distances up the country to keep during winter. The period extends from September to the beginning of April (30 weeks), and the price commonly paid is 5*l.* or 6*l.* a score. The young sheep are thus placed beyond the control and care of the graziers during a large portion of that most important period in the life of an animal—the first year—a period on which will depend, according to the treatment it has received, its entire future condition. Vast numbers of "*tegs*" (as the young sheep are termed) return to the marsh in the spring in a half-starved condition, and

so debilitated are they that many die soon after they are put upon richer pasture. It is this unfavourable circumstance—and the same cause (bad keeping) applies equally to the Sussex breed of stock—that prevents the live stock of Kent from fairly attaining their full development. I cannot help thinking but that something might be done to remedy, or at least to mitigate, this evil. By having large yards and sheds, in connexion with a more extended cultivation of root crops, a great many of the lambs bred in the marsh might be kept there. Thus a less number would have to be sent away, which would stand a chance to fare better. The grand defect in this county in rearing young animals *is not giving them sufficient food and attention; and sufficient care and judgment are not exerted in selecting them for breeding*, otherwise Kent might not rank second to any county in the kingdom.

I would likewise suggest the expediency of planting trees in the more exposed situations of the marsh, which would in some degree modify the rigour of the climate in winter; and while they afford shelter in the storm, they would offer what is of equal advantage to animals—a cooling shade during the heats of summer. Could not quick-set hedges be substituted for post and rail fence with advantage in many situations? They would be quite ornamental, and in the end more economical, beside the shade and shelter they would afford. Elm and white poplar, and other kinds of wood, would grow well here, and would in great measure change the appearance and climate of the district. Formerly the marsh was extremely unhealthy—agues and fevers prevailing alarmingly; but in consequence of draining and better sewerage the salubrity of the climate has of late years very much improved.

Rents vary much in the marsh, according to the situation and quality of the land, from 30s. to 60s. per acre, and in some instances considerably higher. Tithes, 1s. for pasture, 12s. for arable; in some parishes the tithe commutation is not yet settled. The other chief expenses are the “scots,” for protection from the ravages of the sea, and sewerage. Poor-rates are almost nominal, the population being very small, and labour well remunerated. Roads have of late years very much improved, being made and kept in repair with sea-beach at a moderate cost. Yet, what with the ungenial character of several seasons for grazing purposes, and other causes, grazing in Romney Marsh has been for some years past but an indifferent business.

The principal improvements in the agriculture of the county, since the elaborate report of Mr. Boys in 1805, consist in a cheaper, wider, and more efficient system of draining, the culture of root and green crops, and the larger number of cattle and sheep that are reared and fattened, and the consequent increase in agri-

cultural produce generally. The amount of waste land enclosed since that period has been considerable. Numerous small patches along the sides of wide roads have been taken in. The principal enclosures made have been Cox Heath, near Maidstone, consisting of about 1300 acres: this was done in 1815. A large portion of this heath is now in fruit, hops, and arable culture; but the poorer pastures are better fitted for the growth of chesnut for hop-poles—the most profitable culture to which the light stone-shattery soil can be devoted. I may also mention Sydenham and Bromley commons, also Bexley Heath, each consisting, perhaps, of about 400 to 600 acres. These being within a short distance of the metropolis, have been more or less built upon, and considerable improvements made in the appearance and cultivation of the land. There is now but little, if any, waste ground in the county that at present prices would pay for enclosing and cultivating for corn; small portions might perhaps be profitably devoted to the growth of underwood, where a demand for hop-poles exists.

The Commutation of Tithes and the Poor Law Amendment Acts have each operated beneficially on the agriculture of the county. Since the former act passed, more permanent and expensive improvements have been already gone into; a great deal of poor unproductive pasture has been broken up—a practice, there is reason to hope, that will progressively spread: * while the latter has not only reduced the formerly fearful amount of poor's rates, which in many parishes had swollen to an oppressive sum, but has tended to keep up a higher scale of wages, thereby rendering labourers more independent, and promoting a better social feeling between them and their employers. The cottage allotment system is gradually spreading in the county; Sir Edmund Filmer, Bart., M.P., has adopted it, upon rather an extensive scale, on his estate at East Sutton, with very satisfactory results. The condition of the labourer—whether viewed physically, intellectually, or morally—has claims of paramount importance on public consideration. His interests, and those of the art he practises, are inseparable.

The further improvement of the agriculture of this county must, in great measure, depend on carrying out fully the means already commenced—thorough draining, deep and clean culture, and the economising liquid manure, which is now so generally suffered to run to waste. It is a fact deeply to be regretted, that in all our large towns so many fertilizing agents are suffered by

* "A fair commutation for tithe is the measure best calculated for the improvement of this county."—*Boys's Report on the Agriculture of Kent*. First Edition, 1796.

their accumulation and fermentation to vitiate the air and injure the health of the inhabitants, which, with systematic arrangements, might be easily collected and most beneficially applied to agricultural purposes, thereby increasing the fertility of our native soil. In some parts of this county the operation of draining should be accompanied by making larger enclosures, thinning and keeping down hedges, and removing pollards and trees, by which means the cultivation would be rendered both easier and cheaper, and by the free access of air, light, and heat, the crops would be materially increased. I look upon Agricultural Associations and Farmers' Clubs, which have of late years been established in different parts of the county, as among the best and most efficient means of advancing the agricultural art, and deserving of all encouragement and support. I think, too, that a better school system is peculiarly needed, such as would ensure more suitable instruction to the children of farmers and their work-people—a system that should embrace all those subjects which would render a country life more attractive and rational, and the pursuit of agriculture more intelligible. The time is no doubt approaching when the agricultural population will feel more deeply and generally the want of a higher knowledge suited to their calling; which, while it tended to advance the most important of the arts—that upon which millions depend for their daily bread—would render its cultivators more useful, contented, and happy.

I cannot conclude without expressing my grateful acknowledgments and deep obligations to those gentlemen who so readily and kindly afforded me information and assistance whilst going over the county, and for the many valuable contributions with which I have since been favoured.

February 28th, 1845.

XXIII.—*Report on the Exhibition of Implements at the Shrewsbury Meeting in 1845.* By Josiah Parkes, Consulting Engineer to the Society.

A FACT of interest to notice in the record of this meeting is, that the exhibition of implements was equal to the very best which had preceded it. It was feared by many persons that the Shrewsbury meeting—isolated as that town is with respect to railway conveyance and communication, and lying so distant from the eastern and southern parts of England, where many implement-makers reside—might not attract so large an assemblage of mechanical exhibitors as to render the show subservient to the extended objects of the Society, and correspondent to the wishes of its ardent friends. The writer, however, cannot call to mind the absence of a single known meritorious implement; whilst he speaks the sentiments of the oldest appointed judges, and of many constant visitors of the Society's shows, in observing that no previous show-yard has been richer in inventions of promise; and that no one has contained a greater variety of well-manufactured implements. The stands of the exhibitors were perhaps not stocked with such numbers of similar articles as on some other occasions; but this is a desideratum, not an evil. The exhibitors can gain little or nothing by the display of a number of implements of the same kind and make; these, indeed, serve only to encumber the ground, increase the area, and augment the cost of the show-yard, without contributing to its intrinsic value as an exhibition of practical mechanical science, adapted to agriculture, which is the object sought by the Society.

The following are the lists of prizes offered by the Society, and of the awards made by the judges. Under the head *Miscellaneous* in the list of awards are comprised all those implements which received premiums from the judges out of the fund of 100*l.* put at their disposition by the Council, over and above the sum allotted for special prizes nominated by the Council.

For the Plough best adapted to heavy land	Ten Sovereigns.
For the Plough best adapted to light land	Ten Sovereigns.
For the best One-way Plough	Five Sovereigns.
For the best Skim or Paring Plough	Five Sovereigns.
For the best Subsoil Pulverizer	Ten Sovereigns.
For the best Clod-Crusher	Ten Sovereigns.
For the best Scarifier	Ten Sovereigns.
For the best Harrow	Five Sovereigns.

For the best Drill for general purposes, which }
 shall possess the most approved method of }
 distributing Compost or other Manures in a } Fifteen Sovereigns.
 moist or dry state, quantity being especially }
 considered }

N.B.—Other qualities being equal, the preference will be given to the Drill which may be best adapted to cover the manure with soil before the seed is deposited.

For the best Turnip Drill on the flat, which shall }
 possess the most approved method of Distributing }
 Compost or other manures in a moist or } Ten Sovereigns.
 dry state, quantity being especially considered }

N.B.—Other qualities being equal, the preference will be given to the Drill which may be best adapted to cover the manure with soil before the seed is deposited.

For the best Turnip Drill on the ridge, which }
 shall possess the most approved method of }
 distributing Compost or other Manures in a } Ten Sovereigns.
 moist or dry state, quantity being especially }
 considered }

N.B.—Other qualities being equal, the preference will be given to the Drill which may be best adapted to cover the manure with soil before the seed is deposited.

For the best Drill Presser depositing Manure and }
 Seed } Ten Sovereigns.

For the best Horse-Seed-Dibbler Fifteen Sovereigns.

For the best Hand-Seed-Dibbler Five Sovereigns.

For the best Chaff-Cutter Ten Sovereigns.

For the best Linseed-Crusher Ten Sovereigns.

For the best moveable Sheep-fold Ten Sovereigns.

For the best Steaming Apparatus for Roots . . . Five Sovereigns.

For the best Weighing Machine, for Live Cattle }
 and Farm Produce generally } Ten Sovereigns.

For the best Churn Five Sovereigns.

For the best Machine for making Draining Tiles }
 or Pipes for agricultural purposes. Specimens }
 of the Tiles or Pipes to be shown in the Yard : }
 the price at which they have been sold to be } Twenty Sovereigns.
 taken into consideration, and proof of the }
 working of the Machine to be given to the }
 satisfaction of the Judges }

AWARD OF PREMIUMS.

AWARD OF PREMIUMS.	Prize.	Reference to Catalogue.		
		Stand.	Article.	Pr.ce.
1. PLOUGHS.				
To Messrs. Howard and Co., of Bedford, for their Plough for light land; their own invention	£10	51	1	£ s. d. 5 0 0 to 5 5 0
To Henry Lowcock, of Westerland, Marlton, Devon, for his One-way Plough; his own invention	£5	62	1	5 10 0 to 6 6 0
To John Bruce, of Tiddington, near Stratford on Avon, Warwickshire, for his Skim or Paring Plough; his own invention	£5	24	1	5 15 0 to 7 7 0
2. SUBSOIL PULVERIZERS.				
To John Read, of 35, Regent's Circus, Piccadilly, London, for his Subsoil Pulverizer, with iron beam and handles; his own invention; manufactured by R. Stratton, of Bristol	£10	81	3	5 5 0
3. CLOD-CRUSHERS.				
To William Crosskill, of Beverley, Yorkshire, for his Clod-Crusher and Roller; his own invention	£10	17	1	24 0 0
4. SCARIFIERS.				
To the Earl of Ducie, of Tortworth Court, near Wootton-under-Edge, for his Scarifier, or Uley Cultivator; invented by John Morton, manufactured by Richard Clyburn, of Uley, near Dursley	£10	45	14	12 0 0 to 22 0 0
5. HARROWS.				
To Messrs. Sanders, Williams, and Taylor, of Bedford, for their diagonal iron Harrows; invented by Samuel Taylor, of Bedford	£5	69	3 and 4	5 0 0 to 5 10 0
6. DRILLS.				
To Richard Hornsby, of Spittlegate, Grantham, for his Corn and Manure Drill for general purposes; his own invention	£15	46	6	44 10 0
To Richard Hornsby, of Spittlegate, Grantham, for his Turnip and Manure Drill for flat work, his own invention	£10	46	4	28 10 0
To Richard Hornsby, of Spittlegate, Grantham, for his Turnip and Manure Drill for ridge work; his own invention	£10	46	2	23 10 0

AWARD OF PREMIUMS.	Prize.	Reference to Catalogue.		
		Stand.	Article.	Price.
7. DRILL-PRESSERS.				
To Richard Hornsby, of Spittlegate, Grantham, for his Two-Row Drill Presser and Manure Depositor; his own invention	£10	46	8	£ s. d. 14 10 0
8. HORSE SEED-DIBBLERS.				
To James Wilmot Newberry, of Hook Norton, near Chipping Norton, Oxon, for his Five-Row Seed Dibbling Machine; invented by Saunders and Newberry	£15	7	1	60 0 0
9. CHAFF CUTTERS.				
To John Cornes, of Barbridge, near Nantwich, Cheshire, for his Chaff Cutter; improved and manufactured by himself	£10	38	1	{ 5 10 0 to 10 0 0
10. LINSEED CRUSHERS.				
To Alexander Dean, of Birmingham, for his Machine for crushing Linseed, Rape, and other seeds of an oily nature; improved and manufactured by himself	£10	59	12	6 15 0
11. STEAMING APPARATUS.				
To James Richmond, of Salford, Manchester, for his Steaming Apparatus for Roots, &c.; his own invention	£5	67	3	9 0 0
12. WEIGHING MACHINES.				
To H. G. James, of 44, Fish Street Hill, London, for his Weighing Machine for live Cattle and Farm Produce; his own invention	£10	80	2	18 0 0
13. CHURNS.				
To James Richmond, of Salford, Manchester, for his Churn; invented by himself	£5	67	15	5 0 0
14. DRAIN-TILE OR PIPE MACHINES.				
To Thomas Scragg, of Calveley, near Tarporley, Cheshire, for his Machine for making Draining Tiles and Pipes for agricultural purposes; his own invention	£20	70	1	{ 23 0 0 to 26 0 0
MISCELLANEOUS.				
To George Edward Frere, F.R.S., of Edinburgh, for a Harrow called the Norwegian, being imported from Norway, and manufactured by Richard Stratton of Bristol	£10	40	2	{ 10 0 0 to 14 0 0

AWARD OF PREMIUMS.	Prize.	Reference to Catalogue.		
		Stand.	Article.	Price.
To William Edward Vingoe, of Penzance, Cornwall, for his Seed-depositing or Planting Machine; his own invention	£10	50	1	£ s. d. 27 0 0
To Mrs. Mary Cartmell, of 34, London Road, Liverpool, for a Weighing Machine; invented by James Herriot, of Glasgow	£2	5	8	{ 5 5 0 to 22 0 0
To the Earl of Ducie, of Tortworth Court, near Wootton-under-Edge, for his Corn Crusher; invented by George Parsons and Richard Clyburn, of Uley, near Dursley	£2	45	17	10 0 0
To the Earl of Ducie, of Tortworth Court, near Wootton-under-Edge, for his Richmond Cart for general purposes; adapted also as a Harvest and Liquid Manure Cart; invented by Richard Clyburn, Uley	£5	45	9	{ 16 10 0 to 26 10 0
To William Crosskill, of Beverley, for an improved One-horse Cart, with self-acting Tail-board; manufactured by himself	£2	17	10	{ 10 10 0 to 13 10 0
To David Harkes, of Mere, near Knutsford, Cheshire, for his improved Parallel Expanding Horse-hoe; his own invention	£2	31	5	3 10 0
To Thomas Dickon, of Thoresway, near Caistor, for an Iron Horse-hoe; invented by B. Dawson, of Caistor	Silver Medal.	30	2	1 10 0
To Richard Hornsby, Spittlegate, Grantham, for a Double Oil-cake Breaker; his own invention	£3	46	10	8 0 0
To Messrs. Charles Phillips and Co., of Bristol, for their improved Turnip-cutting Machine; manufactured by themselves	£5	68	1	5 0 0
To Messrs. Wedlake and Thompson, of Hornchurch, Essex, for their Haymaking or Tedding Machine; invented by Robert Wedlake	£3	48	1	14 14 0
To the Earl of Ducie, of Tortworth Court, near Wootton-under-Edge, for his combined Threshing and Dressing Machine; invented by George Parsons and Richard Clyburn	£10	45	19	{ 80 0 0 to 115 0 0
To William Sanday, of Holme-Pierrepont, Nottingham, for his Winnowing Machine; manufactured by Samuel Wheatley, of Holme Lane	£10	43	1	14 14 0
To James Spencer, of Hopton, near Works- worth, Derbyshire, for his large Chaff Cutter, his own invention	£5	74	1	10 10 0
To James Richmond, of Salford, Manchester, for his Machine for Washing Potatoes and other Vegetables; his own invention	Silver Medal.	67	14	4 10 0

AWARD OF PREMIUMS.	Prize.	Reference to Catalogue.		
		Stand.	Article.	Price.
To Alexander Dean, of Birmingham, for his Portable or Travelling Steam-Engine, called four-horse power; his own invention	£10	59	1	£ s. d. 160 0 0
To W. C. Cambridge, of Market Lavington, Wilts, for his Portable or Travelling Steam-Engine, called four-horse power; his own invention	£5	53	1	150 0 0
To Lieutenant James Vibart, of Chilleswood House, near Taunton, Somerset, for his Compound Hand-lever Power; his own invention; manufactured by — Richards, of Taunton	£5	12	3	21 0 0
To Evan Thomas, of Keel Meifod, near Welch-pool, for the Lever Power applied to his Scarifier; his own invention	Silver Medal.	21	2	—
To John Read, of 35, Regent's Circus, Piccadilly, London, for his Single and Double Action Fire-Engine; his own invention	£5	81	6 and 7	18 18 0 to 85 0 0
To Edward Hill, of Brierley-hill Iron-works, near Dudley, for his Iron Granary or Store Room, Crane and Winch; his own invention	£2	47	18	6 0 0
To Edward Hill, of Brierley-hill Iron-works, near Dudley, for his general exhibition of Iron Gates, Hurdles, Cribs, &c. &c.; his own invention	Silver Medal.	47	19 to 56	Various.
To Edward Hammond Bentall, of Heybridge, near Maldon, Essex, for his Hand Seed-Depositor; his own invention	Silver Medal.	9	4	0 7 6

NOTE.—The prices affixed comprehend the range of the cost according to the various sizes, fittings, materials, &c. of the implement.

It had been resolved by the Council that, on this occasion, the judgment on ploughs, drills, and tile-machines should not be declared until a second trial of them had taken place at a later period of the year. These deferred trials were accordingly made on the 23rd and 24th of October, on the estate of Mr. Pusey, M.P., at Pusey, in Berkshire. They were conducted under the management of the stewards; all the judges and the respective exhibitors attending. The competing implements consisted of six ploughs, five drills, and three tile-machines, which had been selected by the judges from those put to trial at Shrewsbury; including also the plough and drill which had received the Society's prizes in 1844, at the Southampton meeting. The tile-machine to which the prize of 1844 was awarded did not appear either in the show-yard or at Pusey, to compete with the machines of this year.

The private trials by the judges were conducted both in the field and in the enclosure attached to the show-yard at Shrewsbury, with satisfaction to themselves, and to the exhibitors. This arrangement was first essayed at Southampton, and its advantages, as stated in the Report of that meeting, were fully confirmed at Shrewsbury. This mode of conducting implement-trials may now be considered as incorporated with the system of management to be pursued by the Society at future shows. It was wisely planned, and has been successfully carried out; and with one day added to the term allotted to the judges for inspection and trial, it will rarely occur that any trial need be deferred to a later, or to any other, period of the year than that chosen by the Society for its annual country meeting. Delay in giving judgment is alike injurious to the interests of the exhibitors and of the Society, and it is at the express desire of all the judges that the writer declares their sentiments to the Council in this Report.

Ploughs.—A large number of ploughs were set to work at Shrewsbury on the splendid pieces of land assigned for the trial-grounds by Mr. Isaac Taylor, of Monkmoor. The soil was in admirable temper for the occasion, and the judges had little difficulty in selecting the implements which they deemed most worthy of being submitted to the final trial subsequently made at Pusey. These consisted of

Swing ploughs—By David Harkes, of Mere, near Knutsford; by William Wood, of Knutsford.

Two-wheel ploughs—By Messrs. Howard and Co., of Bedford; by Messrs. Mapplebeck and Lowe, of Birmingham (manufactured by Messrs. Ransome); by Messrs. Sanders, Williams, and Taylor, of Bedford; by Edward Hammond Bentall, of Heybridge, near Maldon, Essex.

The light land at Pusey was precisely of the quality answering to that designation, and after a series of trials of all the ploughs, three of them were culled for the finishing combat. These were respectively made by Messrs. Howard and Co., Messrs. Sanders, Williams, and Taylor, and Messrs. Ransome; and it is worthy of remark that the implements of these three manufacturers had before frequently come into close competition at the Society's shows with varying success. These three excellent ploughs, each being held by the maker's own chosen ploughman, were finally set to work by the stewards, in the judges' absence, to complete a land each. Their performance was then inspected by the judges, and the prize for the light-land plough was awarded to Messrs. Howard and Co. The dynamometers of Mr. Clyburn and of Mr. Bentall were applied, and it appeared from both of them that Messrs. Howard's implement took the least draught, as well as made the best work—a result quite consistent with the experi-

ments previously made at the Society's trials. The judges considered the second-best work to have been done by Messrs. Sanders, Williams, and Taylor; their remark on Messrs. Ransome's performance being that their ploughman was considered to have taken too wide a slice for the depth, which gave his work a less perfect and a less satisfactory finish.

The six ploughs, with Messrs. Ransome's prize-plough of last year, were then transferred to a piece of land on Mr. Pusey's farm at Longworth, consisting of strong *Oxford* clay—a clay of that tenacious, unmixed, and decidedly "*honest*" nature, which also characterises (though belonging to another geological stratum) the Wealds of Kent and Sussex. In this field was working the antiquated wooden Berkshire plough, with its high wheels and gallowsses, drawn cleverly by three strong oxen. On putting the selected iron ploughs into this soil, the swings were quickly doomed as incapable of work. The wheel-ploughs struggled for a while with four horses to each, but no one of them succeeded in turning a satisfactory furrow 7 inches in depth; they laboured, indeed, on the points of their shares only, their hinder parts being nearly level with the top of the furrow-slice, and the team of four being evidently distressed. Though the land had been underdrained at 20 feet apart, and 34 inches in depth, ploughing it with two horses, with any plough, would evidently be impracticable. The judges were of opinion that Messrs. Ransome's prize-plough of last year performed somewhat better than the others, but that none of them were fitted to cope with this peculiarly heavy land. The Society's prize "for the plough best adapted for heavy land" was therefore withheld, on the ground of insufficient merit.

It has been suggested in former Reports that one cast of plough and one form of mould-board and share cannot be equally correct and suitable for all soils; and a useful moral may be drawn by the mechanic from the result of the trials at Pusey, viz., that all that is ancient in agriculture is not, therefore, to be despised: and that there may be very sufficient cause for the dogged preference given by the Berkshire, Kent, and Sussex clay-farmers to their old accustomed implements. It is the business of the ploughwright to discover wherein lies the secret of this excellence, and to apply it, if he can, to the composition of a less cumbersome, more slightly, and still more efficient machine.

One-Way, or Turn-urest Ploughs.—After trial in competition with other ploughs of this kind produced by Mr. Comins, Mr. Read, and others, the Society's prize of 5*l.* was awarded to Mr. Henry Lowcock, of Westerland, Marlton, Devon. This plough, which received a premium at Southampton, was found improved on the present occasion, being less tickle, and more comfortable in the handling; but the judges entertain the opinion that it is

more suitable to hilly than flat districts. It is described fully in the last Report.

Skim or Paring Ploughs.—The Society's prize for this class of implement was accorded to Mr. John Bruce, of Tiddington, near Stratford on Avon, who also received a premium from the judges at Southampton on its first introduction, and an account of which appeared in that report. Extended experience of its use has fully justified the good opinion then given of it.

Subsoil Pulverizers.—Nine subsoil pulverizers were tested by the judges, and their merits carefully examined; the result of the trial being that the Society's prize was adjudged to that produced by Mr. John Read, of 35, Regent Circus, Piccadilly, London; thereby confirming the judgment of the previous year. The writer refers to the Southampton Report for a full description of the nature and action of this simple implement, its efficiency having been proved by most extensive practice. The one tried at Shrewsbury was entirely composed of iron, the beam being formed of a double flitch of light but very strong hollow iron, the invention of Benjamin Stratton of Bristol, which renders the implement particularly well adapted for use in tropical climates, where it is already advantageously known.

Clod-Crushers.—Mr. Crosskill's well known crusher and roller again proved itself to be superior to all competitors, and received the Society's prize. It was tried against one produced by Mr. Garrett and another by Mr. Cambridge. The judges observe that by reason of every rolling rim being separate and all revolving on a round axle, Mr. Crosskill's implement possessed decided advantages over Mr. Garrett's; whilst Mr. Cambridge's might be considered as a fair roller, but was not entitled to bear the name of a clod-crusher.

Scarifiers.—Eleven of these important implements were put to work, the Earl of Ducie's Uley cultivator obtaining the judges' preference, who once more awarded to it the Society's offered prize. The judges deemed the variety of work to which this scarifier is adapted to be one of its greatest advantages, and particularly notice the precision with which it acts as a skim or paring-plough. They consider it, however, questionable whether it may not yet be improved by adapting a method of more instantaneously raising the tines out of the ground.

A scarifier was produced by Mr. Evan Thomas, of Keel Meiford, near Welchpool, which possessed a novel, simple, and powerful leverage, and quickly adjustable; for which leverage the judges awarded a premium of 2*l*. This scarifier acted well both in the ground and as a skim; but its length was thought to be much too great, and therefore that it was not well fitted to work ridged lands.

Harrows.—Of the iron harrows produced by Messrs. Sanders, Williams, and Taylor, of Bedford, it suffices to say that no farmer would use wooden ones if he saw these work. The Society's prize was again awarded for them, as unquestionably the best in the show-yard.

A harrow of an entirely novel construction and of great promise, in the estimation of the judges, was exhibited by Mr. George Edward Frere, F.R.S. of Edinburgh, and attracted much attention in the field. It is called the Norwegian Harrow or Clod-crusher, and was originally imported from Norway by Mr. Frere; the one under notice having been constructed, with some changes, by Mr. Richard Stratton, of Bristol. The acting part of this implement consists of a frame containing four horizontal spindles, on each of which is fixed a set of cast-iron bosses, with teeth projecting from them like the rowels of a spur. These teeth revolve with the spindles, those on one spindle inter-working with the others, so that they severally clear and clean each other. The effect produced is a remarkable bruising, crumbling, or disintegration of the soil, without any clogging of the spikes, or possible derangement of the working parts. The weight suffices to cause the spikes to penetrate to the required depth, which is also governed by an adjustment of the wheels applied for travelling the implement, and for taking it out of work when turning—but it acted quite as well when divested of the wheels and of other paraphernalia, which tended rather to embarrass than assist its good action. Neither stones nor sods appear in any way to obstruct the working of this eminently simple machine, the stones being pushed aside, and the sods torn to pieces. The force was thought to be less than that required to work a common set of harrows going equal depth, and the effect in pulverization much greater. It was tried on two different kinds of soil immediately after ploughing with similarly good results. To what extent this implement may act as a clod-crusher the judges cannot say, as they had no means of trying it—but this distinction may be drawn between it and such an implement as Mr. Crosskill's, viz., that the Norwegian harrow leaves the land perfectly light and loose, whilst the clod-crushing roller gives to it firmness and consistence.

The judges awarded to Mr. Frere a premium of 10*l.*, and Mr. Stratton obtained many useful hints from this first trial of the implement for its future improvement.

Drills.—A variety of drills having been tried at Shrewsbury, a selection was made of those which seemed most likely to realise the conditions attached to the respective prizes offered by the Society. These were transferred to Pusey, and there put to the final test. They consisted of—

A Corn and Manure Drill for general purposes, by Mr. Hornsby, of Grantham.

Ditto ditto by Mr. Garrett, of Leiston

(being the drill which obtained the prize at Southampton).

A Turnip and Manure Drill for flat work . . . by Mr. Hornsby.

Ditto for ridge work ditto.

Ditto ditto by Mr. Garrett.

Ditto for ridge or flat work by Mr. James Smyth of Peasenhall.

These were severally and carefully worked both with dry and moist manures, and the Society's prize for each class of drill was adjudged to Mr. Hornsby, the judges' opinion being that his drills were more open and simple, and more completely accomplished the desired purposes than those produced by any other exhibitor.

The drill may now be esteemed to be capable of putting into the ground with certainty and despatch a much greater quantity of manure than can be required for any given crop, and of well covering it before the seed is deposited; but, though surpassing in power of delivery the amount of manure which a good farmer may at any time have occasion to employ, it will be understood that the apparatus of the manure-box is adjustable to the discharge of the smallest desired quantity, and of whatever nature the manure may be. The same means also which have gradually been adopted by drillmakers to secure the delivery of an extreme quantity of rough and damp manures, prevent the necessity of so carefully screening out stones as was requisite previously to the improved forms of boxes and stirrers. There are points in drills, however, which the judges still regard as short of perfection, and to which they desire to call the attention of their constructors, viz. the form of rollers best adapted for turnip ridge-work on soils of different texture, and the arrangement of the self-acting lateral motion given both to the rollers and coulter.

A premium of 10*l*. was awarded to Mr. William Edward Vingoe, of Penzance, Cornwall, for an implement entered as a seed-depositing, or planting machine, but which may be properly treated under the class of drills. This implement, then a recent invention, was first brought to the notice of the Society at Southampton, reappearing at Shrewsbury with several important additions and improvements. It there enlisted the judges' earnest attention, and received their unqualified admiration from the simplicity of its acting parts, the accuracy of its deposition of seed, and the mechanically good adaptation of means to ends. Although simple, it is difficult to describe. It travels on three wheels, the

leading pair being attached to the shafts, from which pair is derived the small power required to effect the measurement and deposition of the seed. The machine exhibited was capable of sowing six rows of corn or other seed at a time. The apparatus for forming the drills consists of six pressing-wheels, immediately followed by as many narrow hollow boxes or shares, which maintain the little trenches clean and open, and each trench perfectly distinct, until the seed falls into them. Through these shares the seed is conducted by small tubes from the seed-box, or hopper, above them; and immediately behind the shares is placed a peculiarly simple and effective kind of hoe for covering the seed. The seed is received upon sliders resting on the bottom of the hopper, and furnished with proper recipient holes, the size of which determines the number of seeds desired to be planted. Means are provided for striking off excess, and it was found, on repeated trials, that no greater difference took place in the number of seeds deposited than was fairly attributable to the difference in magnitude of the corns. The entire apparatus is readily raised out of the ground at headlands, or when turning.

This machine is especially recommended by the judges to the notice of those agriculturists who have the means and wish to assist in developing and proving the merits of new inventions. If the preparation of a firm seed-bed be a good principle, this machine effects it as well as any presser—pressing and drilling six rows at once, with an adjustment for shifting the widths of the rows from 5 to any other number of inches apart desirable for grain; and it either distributes the seed in a train, or drops it within a small compass.

Drill Pressers.—After a minute inspection and trial of several pressers the Society's prize was bestowed on Mr. Hornsby, of Grantham, for his two-row drill-presser. Some good practical improvements in the manure-apparatus of this implement have been made since it commanded the preference at Southampton (*see last Report*). In the event of a stoppage in the descent of the manure the attendant had, previously, to mount the box and push the manure down with a stick. This defect is now remedied by means of a moveable breast-board applied to the box, having a long iron handle attached to it, which enables the attendant to pull down the manure when necessary direct upon the coulters, so that he has no need to quit his place at the hind part of the drill.

Dibbling Machines.—The prize offered for the best horse seed-dibbler was awarded to Mr. Newberry for his ingenious and now well-known machine. Its great weight is found fault with by some, but that is precisely the quality sought for and approved by other farmers in an implement of this kind. Its greatest pre-

sent defect is not a mechanical, but, nevertheless, a real one, viz., its price; and if it were possible to diminish that, it is probable that many criticisms on the completeness of its performance would vanish. The judges made experiments on the droppings of a five-row and single-row dibbler, which are subjoined:—

Number of corns of wheat dropped by the five-row machine:—

3	5	6	4	2
5	3	6	7	5
7	3	5	1	3
4	5	8	3	5
0	3	1	5	2
3	5	4	2	4
3	3	5	4	7
3	3	5	4	2
3	5	1	5	4
4	3	5	5	4

10 droppings—35 38 46 40 38

Ten droppings of the single-row machine charged with beans, tried three times over, gave respectively 25, 39, 28; the number dropped at any one time varying from 1 to 6.

The accuracy of this important function of the machine was certainly not so satisfactory to the judges as they could desire; but they had cause to believe that it arose, in a degree, from the haste with which the machines had been finished. They also remark that they think the steerage may be improved.

The prize offered for “the best hand seed-dibbler” was withheld. There was no competitor with Mr. Smith, of Droitwich, whose implement was fully described in the Southampton report, and tried on this occasion; but though improved and much commended, the judges did not consider its performance to warrant their bestowing the prize upon it. Its defect lies in its inability to get through a sufficiency of work, not in the apparatus, which is correct and particularly suitable for gardeners’ use.

A silver medal was awarded to Mr. Bentall, of Heybridge, Essex, for a seed-dropping instrument, which was considered to be well worthy of extended practical trial.

The following statement given to the writer by one of the judges at Shrewsbury (Mr. Burness, Park Farm, Woburn), may serve to assist the mechanic in his estimate of what the farmer requires as to speed and cost in dibbling:—“I have this year employed boys, and dibbled 100 acres, the cost amounting to something less than 3s. per acre. The holes are made 3 inches asunder in the row, the distance between the rows being 9 inches, and the number of dibs per acre amounting to 232,320. The boys earn 3s.

per week. I have boys who will, for a short time, make 151 holes per minute, but, of course, they cannot long continue such a rate."

Chaff-cutters.—The number of chaff-cutters exhibited was beyond all precedent. The judges selected twelve machines from different manufactories; the same man provided by the stewards being employed to turn all of them, and the owner himself, or his man, feeding. The rule of length to be cut was half an inch, the substance straw, from the same heap; and the judges report the condition of length to have been so nearly alike that the results could not, in any material degree, have been affected by its variation.

The time given for estimating the quantity cut by each machine was three minutes, after getting into work—the turning man exerting himself to the utmost on each occasion, under the eyes of the judges and stewards. The chaff was measured in a standard bushel. The following were the results, arranged in the order in which the machines came indiscriminately to trial:—

Price.			Work done.		Exhibitors' Names.
£.	s.	d.	Bushels.		
13	0	0	3½		Messrs. H. Smith and Co., Stamford.
7	0	0	4½		Messrs. Sanders, Williams, and Taylor, Bedford.
8	10	0	4½		Mr. James Richmond, Salford.
14	0	0	4	and a fraction	Earl of Ducie, Tortworth Court.
8	8	0	..		Mr. Richard Garrett, Leiston.
8	8	0	3½		Messrs. Barrett, Exall, and Andrews, Reading.
8	8	0	4½		Messrs. Colbourne and Ward, Stratford-on-Avon.
11	0	0	..		Lieutenant Vibart, Chilleswood, near Taunton.
8	8	0	4½	and a fraction	Mrs. Mary Cartmell, Liverpool.
8	8	0	3		Mr. Gillett, of Brailes, near Shipston-on-Stour, Guillotine-engine, by Messrs. Ward and Colbourne.
7	0	0	..		Mr. S. Beardmore, Leek.
10	0	0	6½		Mr. Cornes, Barbridge, near Nantwich.
10	0	0	5½		Mr. James Spencer, Hopton, near Worksworth.

NOTE.—The machines to which quantities are not assigned were considered as producing too insignificant a result to be worth measuring or recording.

After this thorough riddling, there could be no hesitation in the minds of discerning men to whom the prize offered by the

Society should be awarded, and it was accordingly given to Mr. Cornes; and never was a prize more fairly won, nor more correctly bestowed. In addition to this due regard to quantity of work done, and power employed, the judges put Mr. Cornes's implement to the severest tests in respect of its liability to foul or choke, and it appeared that in whatever manner the straw was crammed into it, whether straight, or however knotted and entangled, the result was equally good as regards clearance. Smaller machines than the one submitted to this trial, and at less cost, are constructed by the same maker on similar principles.

A premium of 5*l.* was awarded to Mr. Spencer of Hopton, for his very admirable chaff-cutter, which, though not equalling the foregoing in capability of work, is so excellent a machine, so well made, and so well adapted to *real business*—like all implements of his construction—that the Judges unanimously resolved to confer upon it this stamp of merit and recommendation.

Linseed Crushers.—This was the first occasion on which the Society had offered a distinct prize for the best machine to crush linseed. It was awarded to Mr. Dean of Birmingham, after comparing the quality and quantity of work done by many other crushers in the yard. His machine bruised well 5 pecks per hour, and can be safely recommended as in every respect fitted for farm service; it also bruised barley with linseed better than any of the other machines.

The Earl of Ducie's oat and bean crusher, on the V principle, formerly prized and noticed, stands yet pre-eminent, in the opinion of the Judges, for work of that kind, but was thought not to be fully equal to Mr. Dean's, when crushing linseed alone, or linseed with barley. Mr. Cartwright of Shrewsbury, Mr. Richmond of Salford, and Mr. Spencer of Hopton, severally produced oat and bean crushers deserving high commendation and confidence.

Steaming Apparatus.—Four sets of steamers for roots, &c., were carefully tried, and their merits examined, the Society's prize being awarded to Mr. Richmond of Salford, for his very neat and compactly arranged furnace, boiler, and steaming-vessel; Mr. Richmond undertaking to render the water-feed self-acting; without which provision, and that made quite efficient, no steamer can be considered to be safe against explosion.

Weighing-machines.—A multitude of implements, denominated by the exhibitors *weighing machines*, appeared to contest for the Society's prize; but by far the greater number proved, on testing them, to be unworthy the appellation. This prize was adjudged to Mr. James, of London, whose machine is, as has been observed in former Reports, perfectly correct in principle, and practically

good. The Judges, however, still consider that a greater degree of portability is desirable than has yet been accomplished by Mr. James, or other makers, in order to realize all that is wished for by the Society and farmers generally.

The Judges awarded a premium of 2*l.* to Mrs. Mary Cartmell, of Liverpool, for a simple, cheap, and true machine for weighing sacks and light objects, which is worthy of confidence, and deserves commendation.

Churns.—Mr. Richmond, of Salford, received the Society's prize for a very effective, upright, double-piston churn, which has the further recommendation of being easily worked.

Drain-Tiles or Pipe-Machines.—Eleven different makers competed at Shrewsbury in this class, exhibiting 14 machines of various contrivance. The business of the Judges being to select those for subsequent trial which they might deem to possess the greatest merit, each machine underwent the necessary examination and tests, with clay furnished by the Stewards, and many of them with clay as prepared by the exhibitor. The selection fell on machines respectively made and exhibited by Mr. Clayton, of London; Mr. Beart, of Godmanchester; and Mr. Scragg, of Calveley, Cheshire. The final trial of these was made at Pusey, and the Society's prize then adjudged to Mr. Scragg.

There is so great an interest and importance attached at the present time to machinery for preparing the materials of drainage, that little less than a volume would suffice to satisfy the public appetite for knowledge on the subject. But neither treatise nor manual can make a pipe or tile manufacturer; nor can this Report be extended beyond an explanation of the principal reasons which guided the judges, appointed by the Society, in the application of the prizes placed at their disposal; with the mention of such matter as may be incidental to the particular subject.

Mr. Beart's machine was found to be inferior to both the others—first, in the faculty of freeing the clay from stones; secondly, in the quantity of work done in a given time.

Both Mr. Clayton's and Mr. Scragg's are excellent machines, and they are both practically adapted for the service of the tile-yard. They are, however, constructed on entirely different plans. Mr. Clayton's is a perpendicular and fixed, Mr. Scragg's a horizontal and locomotive, machine. The judges preferred the latter principle, as more convenient, as economising labour, and as saving valuable space in the management of the goods in the drying-shed. The method of cutting off the pipes or tiles to determinate lengths is imperfect in Mr. Clayton's; it is mathematically correct in Mr. Scragg's machine; and this is a matter of no slight importance in stacking the pipes or tiles in the kiln.

The screening, or freeing the clay from stones, roots, or other extraneous matter, is performed with less labour by Mr. Scragg than by Mr. Clayton; but the judges think it possible that cases may occur in which Mr. Clayton's perforated screen may prove to be superior to Mr. Scragg's barred screen, as exhibited at Shrewsbury.

The cost of Mr. Scragg's machine is considerably less than Mr. Clayton's, the dies included; and Mr. Scragg's dies are made on a principle which is considered to be far superior, in the important points of accuracy and simplicity, to those of any other maker of pipe-machines.

Finally, Mr. Scragg's machine was proved to produce a greater number of articles in a given time than Mr. Clayton's, and the latter than Mr. Beart's.

The judges have thought it right to adduce the foregoing close contrast between the merits of Mr. Clayton's and Mr. Scragg's machines, because they considered both of them to possess qualifications of a high order, and far superior to those of any other machines exhibited; and because the reputation of Mr. Clayton's machine has been well merited, and notoriously well established. They do not think they would be doing their duty to the Society without reporting, thus succinctly, the motives of their judgment.

Mr. Scragg's machine is equally well adapted to the manufacture of the horse-shoe tiles as of pipes, and of most other descriptions and forms of articles commonly manufactured in tileries, or required in drainage. The writer has one of them in use, made since the show at Shrewsbury, which produces nearly double the quantity of the machine shown there. It is equivalent to the easy manufacture of more than 20,000 pipes, of an inch bore, per day of 10 hours, and so on in proportion for other sizes; it is also worked at a less cost of labour, and with greater ease to the workmen, than any other machine with which he is acquainted.

This machine is new to the Society, but not so in reality, as a model of it was shown to the writer immediately after the Derby show by Mr. Davenport, of Capesthorpe, Cheshire (Mr. Scragg's employer), who also informed him that it was at work on his own premises, as then constructed with two distinct dies for making horse-shoe tiles. This was set to work in August, 1842, and was, as the writer thought till very recently, the earliest invented machine for producing more than one stream of ware of any kind at a time. It seems, however, that all these inventions—and particularly those for the manufacture of pipes—were long since anticipated by a machine in use at the pottery of Mr. John Watts, of Coleford, Gloucestershire. This gentleman informs the writer that his father purchased a machine for making pipes, and the

exclusive right of using it, forty-four years ago, of a man named Richard Glover, living near Ludlow, in Shropshire. It has been in use, with some improvements, at these works ever since, and fully exposed to public view. It is a screw-press, making 3 pipes at once of 3 inches' bore, 4 pipes of 2 inches' bore, and 6 pipes of 1½ inch bore, of about 28 inches in length each. This date carries us farther back than Mr. Read's invention of pipes in Kent by hand; but it is proper to observe that Mr. Watts's machine has been only employed to manufacture pipes for the conveyance of water for domestic purposes, &c.; and that Mr. Read still retains the presumptive right to be considered the earliest manufacturer and applier of pipes to land-drainage.

Until the appearance of Mr. Scragg's machine, which is now making for the writer 11 pipes, of 1 inch bore, at a time, the meed of precedence in respect of number of articles produced at once, as well as of originality in the invention of pipe machinery, must be accorded to Richard Glover, the inventor of Mr. Watts's machine; and the birth of this invention must have been, by many years, anterior to that of the little single pipe-machine used in Kent and other southern counties, the latter being consequent to the successful use of pipes by Mr. Read.

Moveable Sheep Fold.—The prize offered by the Society for this article was awarded by the judges to Mr. Edward Hill, of Brierly Hill Iron-works, near Dudley; but it was subsequently withdrawn by an order of the Council at Shrewsbury, in consequence of Mr. Hill's refusal to sell the implement at the price declared by him in the Catalogue, he thereby infringing a rule of the Society.

The fold, however, was of a construction which elicited much approbation, being moveable on wheels, furnished with cribs, and admitting of a lot of sheep to be covered whilst feeding, with a run out in an enclosed space at will.

MISCELLANEOUS:—

Carts.—The only carts in the stands of the various exhibitors which were thought to possess superior and novel merit were two; the one invented and manufactured by Mr. Clyburn, at Earl Ducie's Works; the other by Mr. Crosskill of Beverley.

The first is called a "Richmond Cart," which received a medal at Southampton, in consequence of its having an easy method of adjusting the load on descending hills, and its generally good and durable fittings. It was, on this occasion, so arranged as to receive a wrought-iron tank for liquid manure, made to fit into the chest or body, the shipping and unshipping of which was perfectly manageable by one person. This combination ap-

peared to the judges to be one of those practical and useful arrangements which would be suitable to many farmers, and they therefore awarded to Mr. Clyburn a premium of 5*l*.

Mr. Crosskill's is a thoroughly well made and cheap one-horse cart, having a particularly simple and safe tipping contrivance. The especial reason for awarding to it a premium of 2*l*. was the introduction of a self-acting tail-board, which opens and shuts as the body is tipped, or brought home, so that no time is lost by having to unship and ship a tail-board, whether the contents of the cart have to be discharged at once or at intervals.

Horse-hoes.—Mr. Garrett's often prized and excellent implement for hoeing after drilled corn and seeds had no competitors. The judges gave a premium of 2*l*. to Mr. Harkes for his parallel expanding turnip-hoe, formerly prized and noticed, and which was rendered still more steady and effective by the application of coulter before the shares. This may be considered to be the most perfect turnip-hoe extant, price 3*l*. 10*s*. But there was another turnip horse-hoe produced by Mr. Dickon, of Caistor, price 1*l*. 10*s*., which was so good and so suitable for small farmers that the judges thought fit to award a silver medal to Mr. Dickon.

Cake Crushers.—The show-yard contained, as usual, a large assortment of these useful implements; and, after a careful trial of them, the judges again considered Mr. Hornsby, of Grantham, to have produced the best machine of the kind, and accordingly awarded him a premium of 3*l*.

Turnip Cutters.—Mr. Gardner, of Banbury, has at length met with formidable rivals in Messrs. C. Phillips and Co., of Bristol, whose machine, on this occasion, was considered to excel that of Mr. Gardner, and to whom a premium of 5*l*. was adjudged.

Haymaking or Tedding Machines.—The show-yard contained only two of these machines, and, after trial, a premium of 3*l*. was again awarded to Messrs. Wedlake and Thompson for their well-known and very excellent implement.

Threshing Machines.—Several threshing machines were set to work, but the judges are compelled to report the whole of those tried to be much below par, and unfit for good barn service. It will be wise for exhibitors to look to the condition of these machines before bringing them to future meetings, as they will doubtless be subjected to still more rigorous tests than on this occasion.

The only machine to which the judges deem it necessary to advert as possessing merit or novelty, in this class, is the one produced by Earl Ducie, the invention of Messrs. Parsons and Clyburn. It threshes, cleans, and finally sacks the grain. It

was driven by Mr. Dean's steam-engine, and so far gave satisfaction to the judges that they awarded for it a premium of 10*l*. It is a powerful machine; and although, possibly, adapted to the very large rather than to the moderate-sized farm, it was considered to merit high commendation and encouragement.

Winnowing Machines.—It will have been observed from previous reports, and more particularly from that of 1844, that the judges were dissatisfied with the state of invention in respect of winnowing or corn-cleaning machines. Much attention was given to those produced this year, and three machines came particularly to the test of trial. Of these, which were severally exhibited by Mr. Hornsby, of Grantham; Mr. Cooch, of Harleston; and Mr. Sanday, of Holme Pierrepont, Nottingham; the judges have no hesitation in declaring the last-named to be decidedly the best. They report it as producing a better and cleaner sample of grain when passed once through it from the rough, than most machines can effect after three or even four operations; the sample being much superior to that generally shown in markets. They, consequently, decided in favour of Mr. Sanday, and stamped their opinion of the merit of his implement by awarding for it a premium of 10*l*.

Potato Washer.—A medal was again given to Mr. Richmond, of Salford, for his very simple and effective potato and general vegetable washer. This little machine requires only to be known to be universally approved.

Granary Crane, Field Gates, Hurdles, Cribs, &c.—Two premiums were awarded in this extensive department, and both to Mr. Hill, of Brierly Hill Iron-works, near Dudley. A medal was bestowed for his general good assortment and construction of iron, sheep, and cattle hurdles, pens, racks, &c., and 2*l*. for a granary, barn, or store-room, crane and winch, well fitted, and furnished with a jib for turning the goods in or out of the building. Mr. Hill supplies this useful article, with 30 feet of chain included, for the price of 6*l*., deliverable 100 miles distant from his works on any railway.

Garden and Fire Engines.—Mr. John Read, of 35, Regent Circus, Piccadilly, continues without a rival in this department, and the judges awarded to him a premium of 5*l*. for his excellent inventions, of which full mention is made in former reports.

Hand Lever Power.—An award of 5*l*. was made to Lieutenant James Vibart for a newly arranged hand-engine or power applicable as the prime mover of chaff-cutters, threshing, or other machines. An advantage did appear to the judges on trial, and to the writer, to be gained by this engine, and to arise chiefly out of the great weight of the fly-wheel running very lightly on fric-

tion-rollers. The momentum of such a fly-wheel serves to store up, regulate, and equalize the force of the man or men when applied to give motion to machinery like chaff-cutters, threshing-machines, and the like; the resistance of which is perpetually varying. In giving this premium the judges desire it to be distinctly understood that it applies to the power only, and not to the machines moved by it, as neither the threshing-machine nor the chaff-cutter produced by the same exhibitor, and tried with it, were considered to possess merit.

Steam-Engines.—Two steam-engines were exhibited and tried, both of which gave much more satisfaction than those which appeared at Southampton. The one produced by Mr. Dean, of Birmingham, nominally of four-horse power, was certainly equivalent to the effective delivery of a much higher power than that cited by the maker, and when using a safe pressure of steam. The arrangement of the boiler for generating steam quickly, and arresting the passage of sparks, also appeared to the writer efficient and suitable for farm use. The engine, mounted on four wheels, was finished in a workmanlike manner, and obtained from the judges a well-deserved premium of 10*l*.

Mr. Cambridge's engine was improved since its previous exhibition, and though not equal in point of power to the foregoing, it was deemed worthy of encouragement, and received an award of 5*l*.

Harness.—The makers of agricultural harness and gear do not appear to have felt that necessity for its improvement which has often been indicated as an object of importance by the Council. The only article worthy of note in the exhibition was a saddle with a moveable pannel, and a bit for bridles, by Mr. Thomas Taylor, of Banbury, which were much commended by several of the judges.

JOSIAH PARKES.

Judges.

WILLIAM BENNETT, Lewsey, Bedfordshire.

CHARLES BURNES, Woburn, Bedfordshire.

ALBERT EDMONDS, Longworth, near Faringdon, Berkshire.

WILLIAM HESELTINE, Worlaby House, Barton, Lincolnshire.

THOMAS P. OUTHWAITE, Bainesse, Catterick, Yorkshire.

JOSIAH PARKES, C.E., 11, Great College Street, Westminster.

WILLIAM SHAW, jun., Far Cotton, Northampton.

XXIV.—*On Superphosphate of Lime.* By PH. PUSEY, M.P.

DR. LIEBIG'S great discovery of dissolving bones in sulphuric acid for the purposes of manure, has been so clearly established by the experiments as well of the Duke of Richmond as of other farmers, and so fully investigated by Mr. Hannam, that nothing seems now to be wanted but some plan for bringing it within the ordinary routine of farming. Though the mixtures hitherto prepared have answered perfectly, they have mostly been supplied to the turnip-crop in the shape of liquid manure. This mode, however, requires either tedious labour by hand, or an expensive watercart made for the purpose; and in neither way would be adapted, I think, to the hurry which generally accompanies turnip-sowing on a large farm, where on a favourable turn of weather a hundred acres perhaps require to be finished while the soil retains the suitable temper.

It is to the drill, therefore, I have always thought we must look for this object; but before stating the simple plan of mixing and drilling which has answered with me in practice, I will venture to say a few words on the theory of Dr. Liebig's discovery.

Bones, it is well known, have been long used in England for the turnip crop; still though their success on some soils was certain, the cause of that success was by no means so clear: for fresh bones are made up of oil, of jelly or gelatine, and of Phosphorus united with lime. But when the oil was boiled out of the bones they still acted, and when the jelly was burnt out of them they still acted even more rapidly: so that without at all saying that either the oil did nothing or the jelly did nothing, it became clear that the peculiar active principle of bones is the Phosphorus combined with lime; and, as the quantity of lime is insignificant, that it is the Phosphorus—a pale substance like wax, which has the singular property of giving a faint blue light when in the dark. This curious substance, it appears, which may be bought for a few pence at any chemist's, is one of the main elements with which nature works in compounding seeds and roots serving for the food of man and of beast.

In bones, however, the Phosphorus, in an acid state, is compounded with lime in such a proportion as to form a salt called phosphate of lime, which water does not dissolve, and which therefore acts slowly upon the roots of crops to which it is applied as manure. Dr. Liebig knew that oil of vitriol (*sulphuric acid*), if mixed with bones, would take to itself a part of this lime, leaving behind a new salt containing at least a double portion of phosphorus, and therefore called *superphosphate* of lime, which salt being readily dissolved by water, he hoped would afford a more digestible food for the young turnip, and the result has

answered his expectations. Such is the simple history of this great discovery.

Hitherto, as I said, the mixture has been applied as a liquid manure, diffused sometimes in fifty times its bulk of water; and it has been prepared in vessels troublesome to procure and liable to be injured by the acid. Availing myself, however, of a suggestion for dispensing even with these, I formed a flat heap of dry mould about ten feet across, the surface of which was scooped into a hollow basin, capable of holding 20 bushels of ground fresh bones. A little water was poured on, but I have since omitted the water. Sulphuric acid, to the amount of about half the weight of the bones, was gradually poured into this basin. They soon begin to heat, seething violently, and sending out a great deal of steam, with a peculiarly offensive stench; presently the whole mixture wears the appearance of boiling blood, and swells so much from the escape of gas, that the workmen stirring it with their hoes must take great care to prevent it from bursting over the sides of the earthen basin. In a short time, however, the cauldron becomes quiet; and the bones disappear altogether, except a few fragments: so that the heap may be shovelled together, and might be drilled on the same day, but this would not be advisable, as some small lumps still half liquid remain in the compost. On the first occasion the earth and dissolved bones were left mixed together; and though perfectly cool when so left, I learned, on returning, after six weeks' absence, that a second heating had soon taken place, and found that the heap was hot still. The offensive smell was gone, and was replaced by the musky odour of rotten dung. I mention this circumstance because I am anxious to draw to it the attention of chemists. This second fermentation may be that of the animal matter contained in the bones, and may bring out its ammonia; if so, it will be a question whether it be desirable thus to give time for the formation of ammonia before the manure is applied; or whether it be better to drill the compost at once, allowing the ammonia to be produced under ground, and so be supplied to the young plant more gradually.

The compost thus made was tried in July on some light land very much exhausted, and naturally unkind for the growth of turnips. The trial ground was about 2 acres. On one part the compost of bones and acid was drilled at the rate of $4\frac{1}{2}$ bushels of bones to the acre; on another part, bones at the rate of 20 bushels an acre; and I added, on a third part, a manure (purchased from Mr. Fothergill, under the name of Superphosphate of lime) at the rate of 2 cwt.

The bones and acid took the lead of the bones, and kept it throughout. I am bound to add that the superphosphate prepared

by Mr. Fothergill not only surpassed the bones, but also that which I had manufactured myself. Possibly the quantity of Mr. Fothergill's may have been too large for comparison; but though I think my own method of preparing superphosphate a convenient one, when the bones are at hand, it appears also that if we can ensure the delivery of a genuine article, it will be still better to buy this manure ready made. In this trial there could be no doubt that all the three forms of bones acted strongly, for the crop grew vigorously where they were used, while on spots where they were purposely omitted it could scarcely be said to grow at all; and though, from late sowing, and from being left too thick, the turnips had not time to come to maturity, the result was quite decisive for our present comparison. About a fifth of an acre was weighed on each piece, with the following results:—

Manure per Acre.	Cost.	Yield of Turnips.
1. 20 bushels of bones . . .	55s. . . .	44 $\frac{3}{4}$ cwt.
2. 4 $\frac{1}{2}$ bushels of bones with 100 lbs. sulphuric acid . . .	22s. . . .	49 $\frac{1}{2}$ cwt.
3. 2 cwt. Mr. Fothergill's su- perphosphate	14s. . . .	53 cwt.
present price	17s.	

The saving of immediate expense by Dr. Liebig's discovery is certainly very great, if we take it only as from 55s. to 22s. per acre on the turnip land, which should be one quarter of the whole acreage of a light arable farm. The trouble of preparation is slight, and of its application next to nothing: for Mr. Horsby informs me that his turnip-drill will distribute equally as small a quantity as 15 bushels over an acre: as then the 4 $\frac{1}{2}$ bushels of dissolved bones do not require to be mixed with more than ten or fifteen bushels of earth, and his drill holds 25 bushels, the use of this compost would not require more than one stoppage for filling the drill on each acre.

Mr. Fothergill's preparation, if the quantity assumed be correct, was still more successful, and having tried it elsewhere I am enabled to speak most highly of it. A neighbour, to whom I supplied some, found that 2 cwt. of this Superphosphate, costing then 14s., answered better on his land for turnips than 2 $\frac{1}{2}$ cwt. of the best Peruvian guano, for which he had paid 32s.

It is a grey damp substance, partly a powder, partly in tough lumps like dry dough. The same lumps are found in the compost as I prepare it myself. It would evidently be a great waste of manure to drill these lumps into the land without reducing them to powder; but this is not easily done, for they are so tough that no pounding will crush them. As the point is one of importance, I may mention the method we at last hit upon. The whole mass, mixed with ashes, should be passed through a large coarse wire

sieve, and the lumps then be spread about two inches thick on a hard floor. A small garden roller should then be drawn over them backwards and forwards until they are flattened to a uniform cake. If the workmen now work this cake with a fine garden rake, they will find that the tough mass will crumble between its teeth. I dwell upon this, because I think we ought to make it a rule in the use of all artificial manures, by bringing them into a state of powder, and mixing them thoroughly with dry mould or ashes, to spread them so uniformly in the soil that each rootlet of the future crop shall have as fair a chance of finding its portion of food as if liquid manure had been used.

Having tried the method described above, I venture to recommend it to farmers; but I consider it by no means a perfect prescription. It is not clear whether the second fermentation should be allowed to take place or not. It is by no means clear that the proportion of acid (one-half the weight of the bones) might not be diminished. It is doubtful whether the amount of bones, $4\frac{1}{2}$ bushels, be the right dose per acre. It is very likely that Phosphorus should not be administered singly, but should be combined with potash, as Dr. Liebig advises. These are points which I beg to recommend to our members for their future inquiry.

Before concluding, I must mention a process long known in this neighbourhood, which seems curiously to agree with Dr. Liebig's treatment of bone-manure. Mr. Brooks, of Hatford, has for many years assured me that he could make four bushels of bones go as far as twenty bushels by mixing them first with peat-ashes. It occurred to me that since many peat-ashes contain sulphate of lime, this practice might be a self-taught form of the recent scientific discovery. Following his instructions, I mixed eight bushels of crushed bones with sixteen bushels of our brick-coloured peat-ashes, and the mixture was thrown up in a heap. In a few days they began to heat violently, and the heat lasted for about ten days, at the end of which time on opening the heap scarcely a particle of bone could be detected. The whole was reduced to a fine reddish grey powder. The fragments of bone which still showed themselves were exactly like those which sulphuric acid has acted on. On trying this compost by the side of Superphosphate with a crop of turnips the effect was precisely the same. Whether the cause be the same, one cannot of course be certain, until a chemical analysis has been made. The ashes cost only 4*d.* for two bushels, the acid would have cost five times as much. The trial, therefore, will be worth making for those who have bog-peat at hand; though peat varies so much in its elements that there can be no certainty of success. If it fail, there will be nothing lost; if it answer, it may be useful, in Ire-

land especially. The ashes must be moderately damp, for dry ashes, I found, do not exert any action upon the bones.

Such are the assured advantages to be derived to the turnip crop by the solution of bones, but we may further hope to see the use of Superphosphate extended even to corn crops. Theory certainly requires it, for, according to Boussingault, a crop of four quarters of wheat to the acre draws from that acre of ground at least 30 lbs. of phosphoric acid. Experience countenances it, for though bone-manure is usually applied to the turnip crop, its effects, as is well known, are seen in the following corn crops. But further, a direct experiment, too, has proved its success. This was made by Mr. Pemberton Leigh upon wheat, and published in our Journal* last year, but is so much in point that I must give it shortly again:—

One Acre.	Cost.			Yield of Wheat per acre.	Increase per acre.
	£	s.	d.		
No manure . . . .	..	..	..	29 bushels.	
Rape-dust, 5 cwt. . .	1	12	6	38 do. . .	9 bushels.
Urate, 6 cwt. . . .	1	12	6	38 do. . .	9 do.
Dung, 30 loads . . .	4	10	0	40 do. . .	11 do.
Guano, 3½ cwt. . . .	2	4	0	40 do. . .	11 do.
Superphosphate, 6 cwt.	2	4	9	53 do. . .	24 do.

The increase of 24 bushels, that is three quarters of wheat per acre, by the use of Superphosphate, is enormous, equal, in fact, to the whole average yield of many farms, and could hardly be expected again; but though we must not hope for so large a return in money as eight pounds for two, this manure is so cheap that a much smaller increase in the wheat crop would pay for its use.

I have drilled it in this year with wheat, but Mr. Leigh's plan of using it as a top-dressing in March may be a better one, because it is not wanted sooner, being chiefly required for forming the grain, and if applied in the autumn is liable to be washed down during winter. I think that it deserves trial on wheat, and I am sure that we ought now to give great attention to the cheapening of artificial manures. We have succeeded in reducing the expense of draining to one-third of its former cost, and I do not despair that, by equal perseverance, we may, in three or four years, bring down the cost of manures in equal proportion. I believe that all bones should now be sold to the farmer in the cheaper and readier form of manufactured Superphosphate; and that of all compound manures, though potash and ammonia may be required in them, a main ingredient must be Phosphorus.

Pusey, December 29, 1845.

* See account given by Mr. Strouts, vol. v. p. 605.

XXV.—*On the Use of the Spanish Phosphorite as a Manure.*
By Dr. DAUBENY.

IN the Memoir "*On the Occurrence of Phosphorite in Estremadura*," by Captain Widdrington and myself, which was read before the Geological Society, and afterwards published in the "*Journal of the Royal Agricultural Society of England*," it was pointed out as desirable, that experiments should be undertaken with the view of determining, whether this mineral would serve as a substitute for bones in agriculture, provided a sufficient supply of it should hereafter be obtained at a moderate expense.

I have therefore been induced to make trial of the above substance in the neighbourhood of Oxford, both during the past and the present year: on the former occasion, on some land placed at my disposal by Mr. Druce of Ensham; on the latter, on my own premises in the Botanic Garden at Oxford.

The former set of trials, I am sorry to say, led to no result, owing to the dryness of the season, which caused, not only this, but all the other manures which were employed at the same time, to prove inefficient; but the experiments undertaken in the Botanic Garden, during the present year, appear to lead to more satisfactory results.

In this latter case a selection was made of thirteen different plots of ground, all of which might be regarded as in a great degree exhausted, having been cropped for ten or eleven successive years, without the application of any kind of manure, being the same upon which the experiments detailed in my Memoir "*On the Rotation of Crops*," published in the last Number of the "*Philosophical Transactions*," had been instituted. The kind and quantity of the several manures employed are stated below, showing that, whilst in every instance a considerable increase of crop was obtained by the addition of these fertilisers, the Spanish Phosphorite, especially when its action was quickened by the addition of sulphuric acid, proved nearly as efficacious as bones themselves, unless indeed when the latter were very finely powdered.

Now, as the Spanish Phosphorite, which appears to act so beneficially, is wholly destitute of organic matter, it seems to follow that the more valuable portion at least of what is applied to the land, when bones are scattered over it, is the phosphate of lime, and not, as some have supposed, the oil or the gelatine.

These experiments also may serve to illustrate the distinction, which I have pointed out in the Memoir referred to, between the *active* and the *dormant* ingredients of a soil. In the case of that experimented on in the Botanic Garden, it has been shown in page 243 of my Memoir, that the amount of potash, of soda, and

of phosphoric acid continued to the last amply sufficient for many successive crops of the most exhausting kinds of plants.

Yet, notwithstanding this latent wealth, it will be seen by the following Table that a considerable increase of crop was obtained, either by adding manures which contained the same ingredients in a more soluble form, such as bones, guano, stable dung, and phosphorite, or by substances, like nitrate of soda and sulphate of ammonia, the addition of which to the soil might favour the development of the organization of the plant, and thus enable it to extract more nourishment from soil of a certain composition than it could otherwise do.

It remains only to be seen, by carrying on the experiment, as I hope to do, for some time longer, whether the influence of the former class of manures will not continue to be felt, whilst that of the latter ceases after the year of its application.

Turnips.

Produce per Acre.

	Roots.		Tops, including all the parts above ground.		Remarks.	
1. Unmanured	14,298 lbs.		30,591 lbs.		Decaying. 2 lbs. dried by a water-bath weighed 1006 gr.; burnt, 101.5 gr.	
Manured with		Gain.		Gain.	Loss.	
2. Shavings of Bones, 10 cwt. to the Acre.*	lbs. 19,239	lbs. 4,941	lbs. 35,210	lbs. 4,629	lbs. ..	Decaying and small.
3. Chemical Manure— Company's Guano, 260 lbs. to the Acre.	26,058	11,760	28,300	..	2,291	Sound and tolerably equal, but smaller than those from Nos. 2, 6, and 7.
4. Nitrate of Soda, 1½ cwt. to the Acre.	28,459	14,161	45,302	14,711	..	Sound, but rather small. 2 lbs. dried by a water-bath weighed 996 gr.; burnt, 124.5 gr.
5. Spanish Phosphorite, applied alone, 12 cwt. to the Acre.	28,639	14,341	42,016	11,425	..	Sound and tolerably equal. 2 lbs. dried as above weighed 996 gr.; burnt, 103 gr.
6. Spanish Phosphorite, with Sulphuric Acid, 12 cwt. to the Acre.	30,869	16,571	34,476	3,879	..	Sound and tolerably equal.
7. South American Guano, 260 lbs. to the Acre.	31,114	16,816	47,060	16,469	..	Sound and tolerably equal. 2 lbs. dried as above weighed 1226 gr.; burnt, 95.5 gr.

* The small increase of produce in this instance may perhaps be explained by the position of the bed, which was less favourably circumstanced with reference to sun and air than the remainder.

Turnips—(continued).

Produce per Acre.						
Manured with	Roots.		Tops, including all the parts above ground.			Remarks.
		Gain.		Gain.	Loss.	
8. Bones, with Sulphuric Acid, 11 cwt. to the Acre.	lbs. 31,898	lbs. 17,600	lbs. 44,421	lbs. 13,830	lbs. ..	Sound and tolerably equal.
9. Graham's Animal Compost, 260 lbs. to the Acre.	32,109	17,811	33,603	3,012	..	Sound and tolerably equal.
10. Sulphate of Ammonia, 1 cwt. to the Acre.	32,670	18,372	46,464	15,873	..	Sound, but of unequal size.
11. Bones finely powdered, 12 cwt. to the Acre.	36,185	21,887	45,446	14,855	..	Sound and tolerably equal. Tubers rather larger than those from Nos. 5 and 6.
12. Potter's Guano, 260 lbs. to the Acre.	37,201	22,903	42,564	11,973	..	Sound and tolerably equal. 2 lbs. dried as above, weighed 955 gr.; burnt, 96·5.
13. Stable Dung, 22 tons to the Acre.	39,476*	25,178	49,912	19,321	..	Sound, but unequal. 2 lbs. dried as above weighed 1010 gr.; burnt, 102 gr.

* The average of 10 years' successive crops of turnips on the same plot of ground. I find to have been about 16 tons to the acre. In my Memoir on the Rotation of Crops it is stated somewhat higher, owing to a mistake in the measurement of this plot, which I have discovered since the Paper went to press.

Oxford, December 8, 1845.

XXVI.—*On the Spanish Phosphorite and other Manures.* By
SIR H. VERNEY, Bart.

To Mr. Pusey.

MY DEAR PUSEY,—Dr. Daubeny requests that I will communicate to you the result of the second year of an experiment, which I have made by his direction, on a field of heavy sandy loam, resting on a clayey subsoil.

During the spring of 1844 the field, which was wheat-stubble, was prepared for a green crop, and the portion set apart for the experiment, consisting of 20 poles in separate plots of a pole each, was manured and planted with mangold wurzel on May 20th, in the manner described by the following plan:—

1 5½ yards square. Guano, South American.	2	3 Bones unburnt.	4
2 feet.	2 feet.		
5	6 Bones burnt.	7	8 Guano, Potter's.
9 Pigeons' Dung.	10	11 Spanish Phosphorite with Sulphuric Acid.	12
13	14 Spanish Phosphorite.	15	16 Guano, Graham's.
17 Superphosphate of Lime.	18	19 Stable Dung.	20

We had little or no rain after Easter of last year during the whole summer, and in consequence of that remarkable drought there was not a sufficiency of moisture in the soil either to make the seeds germinate, or to enable the artificial manures to act with any effect. A portion only of the seeds came up, at least in time to be of any avail for a crop. Those that first started, whether on the manured or the unmanured land, were ultimately the best roots, so that it was found impossible to arrive at anything like a correct estimate of the comparative value of any of the manures tried on the first crop. I therefore resolved to watch the result of the experiment on the second crop.

In the course of last winter the plots were carefully dug. No part of one plot was allowed to be mixed with another, and the 2 feet wide paths between the plots, which were not dug, kept

the crops sufficiently apart while growing. Chevalier barley was planted in April, at the rate of $1\frac{1}{2}$ bushel per acre, and I send you the result:—

No.	Manure per Acre.			Produce.		
	Tons.	cwt.	qrs.	Qrs.	bsh.	pks.
3. Unburnt Bones . . .	1	7	0	5	0	0
6. Burnt Bones . . .	0	18	0	5	3	2
7. Nothing . . .	0	0	0	3	6	2
8. Potter's Guano . . .	0	3	0	4	5	0
9. Pigeons' Dung . . .	0	18	0	7	5	0
11. Spanish Phosphorite and Sulphuric Acid . . .	0	18	0	6	3	2
14. Spanish Phosphorite . . .	0	18	0	5	3	2
16. Graham's Guano . . .	0	3	0	6	5	2
17. Superphosphate of Lime . . .	1	5	3	5	6	3
19. Stable-yard Dung . . .	20	0	0	8	2	0

The produce of the South American Guano is not given in consequence of an accident in carting it away, which left the true result doubtful; but I may remark that it appeared as good as any of the plots, and was much laid while growing.

The plots are now in seeds—a mixture of five different grasses. The result will be carefully attended to.

Yours very faithfully,

HARRY VERNEY.

*Claydon House, Bucks,
December 19, 1845.*

XXVII.—On the Advantage of reducing the Size and Number of Hedges. By W. CAMBRIDGE.

AMONGST the various subjects connected with farm-husbandry, as much risk is incurred and equal care required in departing from old practices and customs as in adopting others which have not been tested by trial, nor had the sanction of experience.

I have been induced by the success which has for upwards of forty years attended the method of rearing and maintaining hedges, which I have during that period pursued upon the farm which I still hold, to write a few practical directions on that subject, trusting that from long experience there may be no presumption in my endeavouring to contribute in some measure to effect an improvement, which is much needed, in the various plans of fencing most commonly practised.

Until underdraining began to be practised, ditches were indispensable not only as a protection against cattle, and for separat-

ing fields, but also for carrying off the water. A neat and strong white-thorn fence answers effectually both the former ends, whilst the use of draining tiles entirely supersedes the necessity for ditches for the latter, and they are therefore no longer required as part of a permanent fence.

Ditches, when made on high land, very generally remain dry, and are in all cases admirably adapted for raising docks and all kinds of weeds, the seeds of which, when the ditches are scoured, and the scourings used as they usually are for the bottom of dung-heaps, are unwittingly carried and spread on the land, to the great annoyance and disadvantage of the farmer. Their only use is in raising a thorn hedge, and acting as a guard on one side against injury to the quick by cattle and sheep, and that of course no longer than until the young fence is sufficiently strong, which will be in about four years on good land, and five or six on poor land, to resist their attacks, when the ditch becomes altogether useless.

In some parts of Cambridgeshire ditches are not used even in raising a fence, a double row of quick being planted upon a raised bank of about 18 inches in height, and guarded on each side with posts and triple rails. The bank is entirely composed of surface soil, which causes the hedge to grow most luxuriantly. This is a good plan, but it is expensive, the cost for the whole, including the quick, sawing, &c., is 5s. a rod, or perhaps more; but as foreign as well as English fir is now much cheaper than formerly, and will most probably be even more so, I have no doubt this method will become more general.

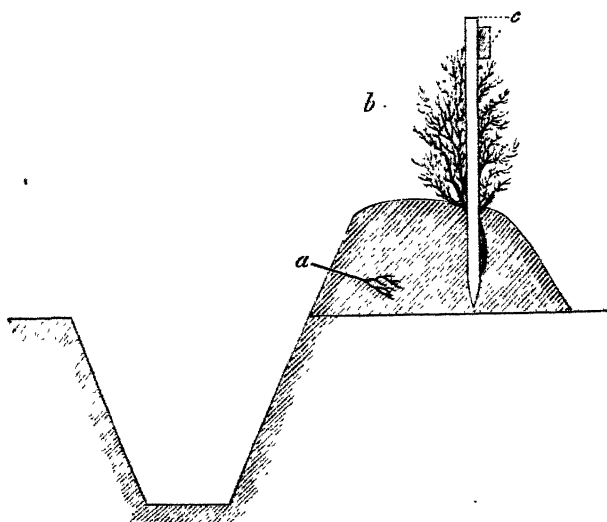
Another plan in Cambridgeshire is to raise a table, as it is there called, with a back ditch on each side, the width altogether occupying about 11 feet. A double row of white-thorn quick is planted on the centre of the table, and a guard is added on each side composed of posts and triple rails. The height of the bank varies from 2 to 3 feet. This method is rather more expensive than the last, the contract price being at this time from 22s. to 25s. per chain.

The double hedges of the north of England, as well as the huge bank and ditch so prevalent in the south, are equally objectionable by reason of the quantity of land they cover. Some of the bank and ditch fences, especially old ones, including the border which must necessarily be left on each side (and which are generally much wider than needful), are 10 or 15 feet wide. This is a great waste of land, more especially where the fields are small, which must considerably diminish the produce, and consequently the profits, and of course be severely felt by the small farmer.

Other points to be considered are the respective merits of high

and low fences. In my opinion, fences, when kept by clipping to a height not exceeding 3 feet, answer every useful purpose. Being thick at the bottom (whilst high fences are always thin), they effectually prevent the passage of sheep, and are sufficiently high to confine all cattle, and they do not, like the high fences, exclude the air from arable lands. The ill effects of high fences upon the corn crops cannot but be obvious to every practical farmer. In harvest time, if a little rain should fall in the night, they cause a delay of some hours each day in carting the corn lying near them, and when in a wooded country, in the opinion of some, cause blight and mildew. A labourer may indeed once in a period varying from ten to twenty years, when they are cut down, reap a share of faggot-wood, but even then very often the greatest part of the cuttings is used as a guard whilst the fence is growing again. Corn crops when growing near high fences are, from the eddy in the wind which they occasion, more liable to be thrown down and injured by storms beating upon them, than when growing by low ones. Another objection too, and that not inconsiderable, is the shelter and encouragement given by fences when high, to vermin, sparrows, and other small birds. The larger the fields, of course the less the injury from high fences, but they are always useless, and generally speaking, injurious.

The plan which I have pursued for so long a space of time, and which I will now describe, I have found to combine all advantages which are to be derived from the various methods of fencing. The land intended to be taken for a new fence should be well tempered and cleaned, as well for the riddance of weeds, as for the advantage of the roots of the quick. A ditch is then to be set out 4 feet wide, part of the top soil being carefully placed as a bed for the young layer or quick. This bed will raise the quick about 8 inches from the surface soil; the layer is then to be placed on the bed in an inclined position, as represented in fig. 1 (a); the remainder of the top soil is then to be carefully laid on the roots of the quick. The rest of the earth being thrown on will complete the bank on which is to be placed a dead thorn hedge (b), as a protection on that side, and the ditch when finished will be about 3 feet deep. The layer is to be cut off so as to stand out about 2 inches from the bank. A single row of nine sets in the yard is sufficient. I have found the first winter quarter to be the best time for planting, and the layer should be four years old, having been transplanted at two years' growth from the seed-bed. The dead fence will last two years, but may be made to last longer, if at the end of the first year a light single rail and post of English fir is added, as shown in fig. 1 (c). This will generally last till the fence is fit to be thrown open to cattle.



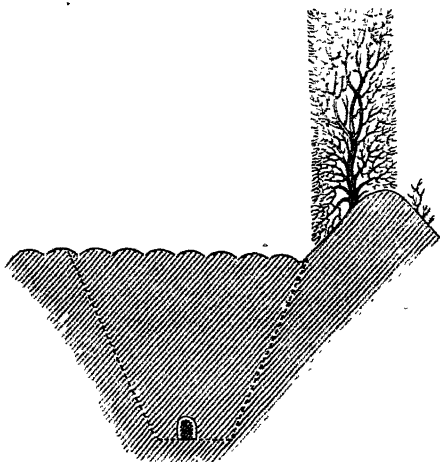
The cost of making a fence of this kind is from 2s. to 2s. 6d. a rod.

Little will be required the first year besides cleaning, which should be done by hand, as the hoe or spade wounds the plants, and draws the mould off the banks. If grass or weeds are suffered to grow, the layer will fail in producing a sufficient number of shoots. At the Michaelmas after planting, the young shoots being then of one summer's growth, should be clipped to a uniform height.

Great attention must be given the first two years in clipping off lateral or side-shoots close, as this renders the fence impenetrable at the bottom. Perhaps it may be more prudent to clip young fences for the first year or two, after the leaf is off and the sap is down, although I have never observed any ill effects from summer clipping. If the young fence is allowed to grow up too fast at first, the result is sure to be a thin fence below, and it is better to reduce the length of the shoots often, than to cut off the young layer close, after it has been planted two years, a plan pursued by many persons in order that more numerous and vigorous shoots may be thrown out.

As soon as the fence is sufficiently grown to withstand cattle, which as before stated will be in about four years on good land, and five or six on poor land, the dead fence may be removed, and part of the bank may either be carted away or returned to the ditch, which, being now useless, can be levelled down with the

plough, laying in draining-tiles where required. You will then lose only the space covered by the fence, and gain what would otherwise be waste land. A section of the fence when clipped to the form in which I clip mine, would appear as in fig. 2.



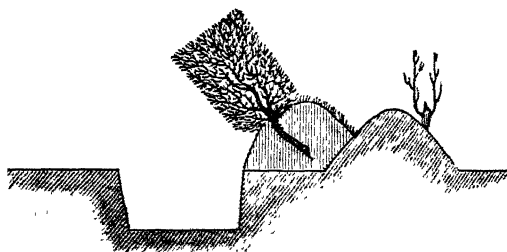
Where water is conveyed to the ditch (the ditch having been made the principal outlets of under-drains), care should be taken to lay down draining-tiles suited to the quantity of water that may have to pass through, increasing them in size as you approach the outlet.

The great difference between the plan which I have so long pursued and that of most others, lies in my fences being clipped twice a year with garden-shears. Shears are preferable to the bill-hook or scimitar, as it is difficult to keep fences within bounds by either of the latter implements. I clip near 12 miles, exclusive of plantation-fences, twice in every year, viz. June and October, at the cost of 10s. per mile or thereabouts, the fences being from $2\frac{1}{2}$ to 3 feet high, and about 1 foot in width. At the end of the fourth or fifth year from planting, a fence should not be more than $2\frac{1}{2}$, or at most 3 feet high, and this added to the height of the bank, which will be about a foot, will be sufficiently high for all useful purposes. The form in which they are clipped is not material. I have always clipped mine square at the top, as shown in fig. 2.

It is scarcely possible to say how long a fence under this management will last good. I planted a fence thirty-eight years since on a poor soil, laying a bed of clay beneath the young quick, and cut it quite down at eighteen years; about sixteen years after, making thirty-four from raising, I split it down the middle with a

sharp bill-hook, cutting a foot off the top. It is now an excellent fence.

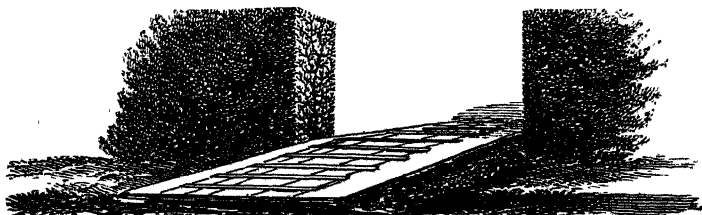
The plan of cutting or splitting a fence in half, to which I have just alluded, answers better on arable than pasture-land, and is performed by cutting off all the shoots on one side close to the main stem, which will reduce the thickness of the hedge nearly one-half. Where the fence separates arable from pasture, it is better to cut on the arable side, but the plan itself is only a saving of expense, or else a substitute for a better plan of renewing the fence when it has become too large. This latter method is by cutting the whole of the fence down, the strong stems being cut down close, and the weaker ones left of different lengths, according to their strength, as recommended by Mr. Blaikie in his treatise on the management of hedges. Care should be taken to follow the advice there given of cutting upwards. Where the fence cut down divides arable and pasture, the clipped hedge cut off will form an excellent protection on the pasture side, where the most care is required to guard against cattle. In doing this a grip is made 3 feet behind the hedge on the grass side, 1 foot deep and 2 feet wide, by cutting out two sods. One sod is placed upon the edge of the grip next the fence, for the dead hedge to rest upon obliquely, the other sod is then placed on the stem ends, and is sufficient to hold them down, as shown in fig. 3.



This operation costs, cutting and placing, 4*d.* per rod. At the end of the second or third year the dead fence will scarcely be a sufficient guard against heavy cattle, and a fresh one should be substituted, which can generally be obtained from the arable lands, as in cutting down a fence which divides arable only, it is seldom any protection is required. If, however, another dead fence cannot be obtained, posts and rails must be substituted. The fence as it grows again will not require so much trouble and attention as in raising a new one, as the old stubs will send forth a great number of strong and vigorous shoots. These must, as before directed, be regularly clipped, the shoots at the lower part being cut off pretty close, in order to make the renewed hedge thick and close at the bottom, and it should not be allowed to

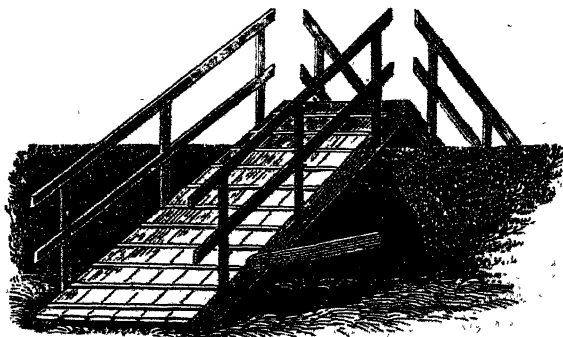
increase in height too quickly. A fence, when renewed in this manner, will be, when properly clipped, I think, if possible, closer and even more matted together than one fresh raised from young layer. Their neatness, when either fresh raised or renewed, can scarcely be appreciated but by those who have seen them. In form they almost resemble a brick wall, and are so firmly entangled that I have had some trouble in preventing my farming-boys from amusing themselves by walking on the top.

I have carted clay over these fences by bending down towards the lowest side of the fence a sufficient portion of it to allow a cart to pass, having first separated it from the rest of the hedge by cutting from top to bottom with a bill-hook. The part bent down is confined by a board constructed for the purpose. Logs of wood are placed under the board, as well for the purpose of strengthening it, as for preventing the portion of the fence bent down from being injured. I have carted heavy loads over a bridge thus constructed for upwards of three months at a time, at the end of which time the hedge has been returned to its proper position, and the place in the fence could scarcely be seen. I have endeavoured to represent this by fig. 4.



It may not be out of place here to give a sketch, fig. 5, of another portable bridge which I had constructed for the convenience of driving sheep to and from fold over the fence, in any direction required :—

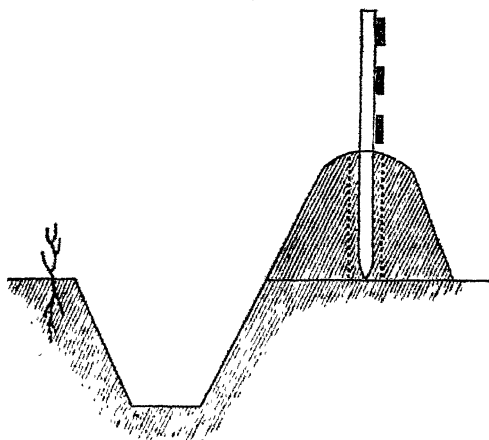
Fig. 5.



Length of each half of the bridge	10 feet.
Width of ditto	4½ "
Length of stay-brace which regulates the bridge according to the height of the fence	13 "

In forming a fence to divide a plantation from pasture, the best plan to be pursued is to make a small ditch on the side next the plantation about 3 feet wide and 2 feet deep. The sods to be taken out of this ditch are to be placed carefully with their grass sides outwards, in order to form a bank next the pasture. They are to be so placed as to leave a small space in the middle of the bank, to be filled up with the remainder of the earth to be taken out in forming the ditch. A fence of posts, to be placed 5 to 7 feet from each other, with triple rails, both posts and rails being of fir, is then to be placed on the bank. The quick should be planted perpendicularly on the edge of the ditch next the plantation. A double row of sets planted about 5 inches from each other in this form answers best. The young fence, as to clipping, &c., is to be managed as before described. In about four years the bank may be thrown into the ditch, and all will then remain as level as before. This mode of fencing is shown in fig. 6. A dead thorn fence will of course answer the same

Fig. 6.



purpose as the posts and rails in protecting the young quick, but it would have to be renewed at the end of the second year, and is not always to be procured.

In taking away the banks which have been raised in forming fences, where the soil is poor, a dressing of rotten manure (flagged over with grass sods, where the fence is next a road), adds much to the growth and security of the roots; and where failures have

been found from the bite of hares, or otherwise, in its early growth, which cannot always be prevented, privet, briar, or holly will grow, if laid in with a little good earth, with a few posts and rails at the back to guard it. But with common care, on good soil, failures will seldom if ever occur.

I have raised a new fence with elder plants only (although not handsome, a live one) on an old bank, parting the bounds of property, where the site could not be altered, and on the north side of a wood. The elder slips were about a foot and a half long, set one year in a piece of garden-ground before removed to the bank, and almost every cutting grew.

In endeavouring to improve old fences, I have never succeeded in rendering them either uniform or safe, and should recommend, where a good fence is required, levelling the old and raising a new one. Young layer will not grow upon an old bank, at least I have never been able to rear it; and when an old bank is levelled down, it should be left till the next year, if it can possibly be allowed to do so before a new fence is set out in its place.

At the enclosure, in 1816, of the parish in which my farm is situate, 80 acres of rabbit-warren were brought into cultivation, and the banks, where they have not been carted away or thrown over, now remain covered with furze, as all the common was at the time of the enclosure. Upon this soil, which was of the worst description, being chiefly black sand, upwards of 2000 rods of fencing was made at that time. In raising these fences the treatment only differed from that before described, in placing a bed of clay beneath the young layer. This I should always recommend if the soil is poor, and if manure is added with the clay the better, but a thin covering of earth should be placed over the roots of the young layer before the manure is applied.

The modes of fencing which I have described will, if carefully practised, produce all that can be required for strength, durability, and neatness, occupying as little space as possible, and are equally applicable to all kinds of well-drained land, as well arable as grazing ground; but it cannot be expected that a tenant-at-will, or even with a short lease, can be at the expense of raising good fences on all situations, and on all soils, when it takes more than the length of his lease to bring them to perfection; nor is it possible to rear them under or near large trees, which tend as much to the deterioration of the fences as of the corn and other crops growing near them.

White-thorn will not grow if overshadowed, and a perfect fence cannot be made where the line is broken by hedgerow timber. Few are aware of the actual amount of injury to the farmer caused by trees in the hedges, nor can it with any certainty be ascertained. Their roots extend on all sides, extracting the nourishment from the soil, and robbing both the fence and the corn.

The roots of the common ash extend further than those of most other trees. I have taken one up which measured in length 95 feet.* Besides the injury caused by the roots, when planted thickly in the hedges, they prevent in a great measure the free access of air to the enclosures surrounded by them, and though, perhaps, vegetation in the grass fields, when sheltered by them, may commence earlier in the spring, yet grass when shaded from the sun is always of an inferior quality.

As far as regards their appearance, which is of so much consideration to many landowners, they are generally stunted and not unfrequently distorted, and, being planted at regular distances, are excessively formal, and, I think, with the careful hand of the landlord, their numbers might be considerably reduced to the improvement of the landscape and the great advantage of the tenant. A few fine trees scattered in pastures look well, and will answer as well there as anywhere else as a shade for cattle in summer.

The question as to the benefit (if any) derived by the landlord, from timber being grown in the hedges for repairs, and various other purposes connected with farming, is foreign to the subject of this paper; and there are various spots and corners on most farms, which, from their position, are inconvenient to cultivate, and which are frequently seen lying waste, well adapted for planting with trees, by which the landlord would, at any rate, derive much benefit (as the timber raised would be much better in quality and quicker in growth), and which, as far as appearance is concerned, would be much more ornamental than when trees are planted in hedgerows.

There are few tenants, at least in my neighbourhood, who would not more willingly give up small pieces of land for planting without having any allowance made in their rents than have trees in their hedges.

Admitting, as I freely do, a strong predilection for living fences on farms, I am far from contending or expecting that a quickset hedge, without a ditch, or upon a floor bank, as it is in some places termed, should, or ever will, under all circumstances, be the fence universally adopted throughout a country varying in resources, and in which very opposite and long-rooted habits and usages prevail, but I am nevertheless of opinion, that wherever the living fence is preferred, the landlord and tenant will equally find their advantage in clipped thorn hedges, such as I have endeavoured to describe, and in the rearing and maintaining of which, I am not without a hope that the foregoing hints may be found useful.

* This root I caused to be laid by the turnpike side for public inspection, with the words "Ash 95 feet" painted upon it.

South Runcton, Downham Market.

XXVIII.—*On the Disease in Potatoes.* By the President, Lord
PORTMAN.

To Mr. Pusey.

MY DEAR PUSEY—I send you the observations which I have made upon the crops of potatoes grown in my garden and in my fields this season, which you asked me to send you for publication in our Journal. As soon as I had observed that the potatoes in my Garden were diseased, I had the whole crop dug up, and found a great quantity so much affected as to appear to me to be useless. Of the worst tubers I selected a dozen from each plot of ground and placed them on the earth under two hand-lights, and constantly observed the progress of the disease. For three weeks it advanced rapidly, and the stench was dreadfully offensive, but at the end of a month no smell remained; and in six weeks I found that they were in the following state under each glass:—Some were quite dry, and crumbled to dust; some were extremely wet, and had the appearance of an ulcer in a state of viscous matter; and the rest had put forth shoots more or less healthy. Of these last a few eyes had shot a length of half an inch and died, and the whole tuber had become wet—ulcered. The others were so vigorous that I cut away the sound parts with the eyes and planted them in pots, placing them in my hot-house. Parts of each of the potatoes that grew were in the wet-ulcer state.

These plants are now growing well, and are 18 inches above the pot—healthy vigorous plants; and the pots are as full of fibrous roots as possible: some small tubers are already formed. While the potatoes were under the hand-lights, there was a good deal of sunshine and very little rain; and I think that the warmth materially hastened the progress of the disease. Of the remainder of the garden crop part were stored in very shallow heaps, and part were spread on a dry floor; and by carefully picking out all that exhibited any signs of disease, I have a good stock in a sound state. I found that in each of the first three weeks a few diseased tubers were picked out of each store, and I ordered a quantity of slaked lime to be shaken over the tubers, and since that I have found no increase of the disease. The eyes of the tubers are springing very freely, and I have planted for the crop for 1846 all those that exhibited that tendency to premature growth; as I think it important for a crop to have the advantage of all the vegetative power of each set. The ground was dug in November for the winter fallow, and several potatoes were found in it which had not been picked up when the crop was taken off: none of those which were so found had decayed, though some were slightly diseased.

The potatoes in the Field had been planted in Northumberland ridges at the usual planting time, and were well dunged with farm-yard manure. They did not come up very kindly nor regularly, but soon made a great show of vigour. Nothing more than common appeared till towards the end of August, when the foliage appeared to be touched with frost or scorched, and the smell from them was somewhat offensive, though not very strong. About a week after the appearance of the decay the stalks were all cut off close to the earth, and most of them taken off. The potatoes were taken up about Michaelmas in dry weather; they were remarkably clean and nice looking. The diseased potatoes were picked out and soon after steamed for the pigs, and given to them in the usual way without any injurious results; the sound potatoes were piled away in a long heap at the end of a barn which is dry, cool, and airy; after they had been there about a month they were turned over and the diseased potatoes were picked out and steamed as before: the sound tubers were stored back with lime in a long heap—I bushel of lime, which was *very mild* and powdered, to 1 sack of potatoes; the small tubers were picked out and placed by themselves without lime. Both heaps have now been turned back, and none are diseased. When first taken up, some of the potatoes were cooked: they were not good, but waxy and soapy; they have gradually improved, and are now mealy and fine flavoured. The tops were cut off before the potatoes were ripe, which perhaps caused them to be waxy and soapy when dressed. Their recent treatment has tended to improve them; and a similar plan of treatment would probably do so in all seasons. There were two sorts of potatoes in the field—a round red potato, and the salmon kidney; the latter were the most affected by the disease. The land on which they were grown is light and dry, on a chalk sub-soil, the aspect north-west. The crop for 1846 I commenced planting in November; the sets were small and sound, planted whole and well rolled in lime. Some were planted under the dung, others over the dung, and some without any manure at all, being intended for a top-dressing in the spring. A good many of the sets have been examined since, and all continue good as when they were first put in. It is difficult to persuade persons to plant potatoes now; their great objection is that their manure is not ready.

I have ordered that no potato shall be consumed in my house or on my farm until the eyes have been taken out, as advised by Dr. Lyon Playfair in his admirable lecture; and I have appointed some careful labourers to take out, week by week, the eyes of the potatoes required for a week's consumption; and I have arranged to store the eyes in wood ashes, charcoal, and other dry materials. If this plan is as successful as I anticipate, it will be good for all

years, and will supply abundance of sets, and not perceptibly diminish the food of the population.

I have also heard of great success having attended the following experiment, which I am about to try:—Place the tubers in a moist, dark place, at a temperature varying from 50° to 60° Fahrenheit. Here they will push out shoots which will grow to 8 or 10 inches, and then throw out fibrous roots at the lower points. These should be taken off without being bruised, and immediately planted in a hot-bed, with the tops just above the ground. The parent tubers will throw out a second similar set of shoots which may be similarly treated, and the tubers may then be planted at the usual time. Thus from one tuber three sets for a crop may be obtained. This plan is not likely to succeed with all sorts of potatoes, and probably not with the ash-leaved kidneys and others of a like nature; but it is worth trying where it is possible when seed is scarce. I will report to you in the month of March the progress of my experiments.

Yours truly,

PORTMAN.

Bryanston, December 18, 1845.

XXIX.—*On the Cultivation of the Potato.* By HENRY COX.

[This paper was sent in before the new disease of the potato had become known.]

THOUGH much has been said and written on the cultivation of the potato, room is still, I think, left for a few practical remarks.

The exact date of the introduction of this valuable article of food is not known. In England it made but little progress till within the last sixty years, before which time the common mode of cultivating them was to strew a little litter over the ground where they were planted, and to dig a few as they were wanted.

About that time my grandfather planted towards three-quarters of an acre in a field now occupied by my father at Avening in Gloucestershire, which so astonished the inhabitants, that it became matter of discussion what he intended to do with such a quantity of potatoes; and the old inhabitants remember even now how people thronged from the neighbouring villages to see so many potatoes growing together.

Since that time they have become of so much importance that a failure for one year in the potato crop would be a great national calamity, as many of the labouring population depend upon their crop of potatoes for their chief subsistence; they are also become of much importance in the feeding of cattle; so that I think no

farmer should be without a considerable stock of potatoes. I have for several years been trying experiments in the cultivation and preservation of potatoes, the results of which have led to a somewhat different course from that pursued by many cultivators of this valuable root. I am aware that many will say it is too troublesome; but this is a mistake too often indulged in; for if we take 5s. worth of trouble more than ordinary, and we get for that 5s. expended 15s. worth more crop than if that 5s. are not expended, all will agree with me that it is a fallacious objection.

Many writers have asserted that the potato should be perfectly ripe before it is taken up to be stored away for seed; but this certainly does not agree with my own practice. My attention was first led to this point merely by accident: for having to dig some early potatoes every day in the fore part of the summer for the use of a family, some that were greened before digging, and some that perhaps were not large enough for cooking, were from time to time cast to one side of the bed; these having lain in the sun some time and become quite green, I selected the best of them to put away for seed, and the pigs had the others. The chief part of my seed-potatoes were however left in the ground to get quite ripe. The next season I was surprised to find a very much better crop from those which had been accidentally dug before they were ripe than from the main crop; still I was not satisfied that it was the seed which made the difference. The same summer, however, I dug half my seed-bed about three weeks before the potatoes were ripe, and left them on the ground until the other half was ripe also, when both were stored in the same quarters. In April following I took some from each heap, and planted them alternately row by row; of those taken up before they were ripe, not one failed; but of those left in the ground until they were quite ripe, about one in twenty-five failed or went blind. About the middle of July the crop was taken up and carefully weighed: two rows of those grown from seed dug before it was quite ripe weighed 69 pounds, while the two rows from the seed left in the ground until quite ripe only weighed 57 pounds. The sort was the early ash-leaf kidneys, the land strong loamy soil.

This led me to conclude that the seed-potato, or, more properly speaking, the potato intended for sets, should always be taken up about three weeks before it is ripe, because it is my opinion that the unripe potato decays more readily, and so is more easily worked upon by the young stems before they can fix their roots firm enough in the soil to support themselves independently, than when it has been left to get perfectly ripe before taking up. Every cultivator of the potato knows that if the tuber that was planted for seed is not decayed, the produce is but small and few.

Secondly, if the potato is left in the ground until it is perfectly ripe, or till the haulm is quite dead, the eye becomes quite formed, which may become suddenly checked, or sometimes bruised, when a kind of mould almost imperceptible fixes sometimes on the eye, and, if it does not quite kill the embryo bud, lays the foundation for the curl, &c.; or the bud, if it chance to escape either, is generally weak and unproductive.

It has been frequently asserted, that cutting potatoes before planting is the cause of failure in the produce: this I am fully convinced is a fallacy, for it is my invariable practice to cut a small portion of the potato off before planting for the purpose above mentioned, of causing it to decompose; even when the tuber is not large enough to make two sets, it has been the practice of myself, my father, and my grandfather, to cut our potatoes for planting, and we have never yet found it to produce a failure; but on the contrary, when properly cut and laid thin on the barn-floor, or some other dry place a fortnight before planting, the very best results have occurred from the practice. We always find middle-sized tubers cut in two (taking care to divide the number and strength of the eyes equally) to be the best for seed; care should also be taken not to rub off the bud, or if the shoot be by accident allowed to get too long, it should be rubbed off and laid in some dry place until the bud is formed at the eye again, for if planted just as the spire is rubbed off, and wet follow, they are very apt to go blind, and not shoot at all.

Time of Planting.

The time of planting potatoes must depend on sorts, soil, and weather; but as a fair medium I should say for early crops and sorts, March; for second early, April; and for late, May; if planted earlier they are liable to many accidents; some soil becomes close with the rain, and consequently the tuber cannot swell, neither can it receive the air as freely as it requires. It sometimes happens that we have a very fine March or April, and a very cold May. When this occurs, potatoes that have been a long time in the ground, and are just ready to burst forth, receive a great check, especially in wet or adhesive soil, there being a constant struggle between the tuber to push forth its spire and the atmosphere to keep it back, until a substance is formed in the spire which actually becomes a tuber, and other stems or branches form in the same manner, till we find a quantity of small tubers formed instead of a plant of green and healthy foliage. This is what country people call Bobbing Joans. My opinion is that it is not an inherent disease of the seed-potato, but is occasioned by—first, early planting; secondly, planting in wet weather and in adhesive soil; and, thirdly, by planting after the stem and

roots are emitted some distance from the potato. Several experiments seem to confirm me in my opinion. In, I think, 1834, I planted some ash-leaf kidney potatoes the last week in January, in a border, covered with litter at the foot of a south brick-wall : now two out of seven of those planted at this time produced Bobbing Joans ; that is, they produced small tubers under ground, but never produced stems or branches above ground. The last week in March I planted in the adjoining portion of the border some more potatoes from the selfsame heap, and without any more attention, and among nearly 500 sets not more than two produced Bobbing Joans. The fact is, the ground was in better order for receiving the tubers in March, because it was drier and warmer, better capable of being properly pulverised, and not liable to be beaten hard with the rains before the growth took place. I have frequently noticed of late years that there is a sort of fungus which attaches itself to the potato, particularly on light land with a clay subsoil ; this makes its appearance when the potato is quite ripe, in the shape of an almost imperceptible pinkish network, which completely envelopes the tuber. These should be carefully looked after and used at once, for if suffered to get into a heap of seed-potatoes, the chance is ten to one if it do not make half of them blind.

All potatoes intended for seed should be sound ; that is, should not have that hollow core in the middle which is frequently found in large-sized tubers, and should be free from mildew or fungi of any kind ; the eye should be as shallow as possible, and all that seem to be running wild or degenerating from their true sort or character, should be rejected ; a change of soil, too, and situation, is particularly necessary.

We now come to planting. We very often see persons planting potatoes with a dibbling-pin, just as we set beans. This must be decidedly wrong, because the tuber cannot swell in so confined a space, and the pin often renders the ground so hard around the side of the hole, that it is impossible for the tuber to strike out of it. The peculiar construction of the potato-plant seems to prove that the breast or hand-plough is the best instrument for planting potatoes ; the root seems to delight in rather a firm soil, while the tuber is best and will thrive best in a very light and hollow soil. Now by the use of the hand-plough, the plant is so far accommodated, as the man using the plough, and likewise the boy who lays down the sets, tread in the bottom of the furrow, and thereby render it somewhat firmer than the top, which is not trodden upon at all ; there is likewise a sort of parting in the soil, which the tuber striking out horizontally from the bottom of the stem delights to run in : these desirable objects cannot be attained either by the horse-plough or the furrowing-hoe or plough.

There is another point in planting not properly attended to, and by some studiously avoided; that is, the placing the eye of the set nearest the bottom of the furrow; the roots of the potato shoot forth from the same eye as the stem, or rather at the base of the stem; now if the eye is placed nearest the bottom soil the roots strike into the soil, and begin to perform their functions at once; but if the tail, or that part of the tuber that has no eyes, be placed on the soil, the roots have very frequently to run an inch or two round or down the side of the set before they reach the soil at the bottom. If the soil is rough or cloddy, it often happens that it does not close in round the set; even if it do, and a few very hot and dry east winds should follow the planting, the roots just emitted, being so tender, must inevitably suffer materially. Besides, when a large set is put in the ground with the eye nearest the surface, when the set decays there is left a large hollow space just at the base of the stem, which often causes the roots to break off at the union of the root and stem.

But lest I should be thought too theoretical, I will give a few experiments made in the years 1839-40-41-42, and 43. The sorts used were in 1839 the Ash-leaf kidney; in 1840, the Noblow; in 1841, the Common Purple; in 1842, the Prolific; and in 1843, the Red Kidney: the depth of the furrow 5 inches:—

	Produce per Square Rod.				
	1839. Ash-leaf Kid- neys.	1840. No- blows.	1841. Com- mon Purple Red.	1842. Prolific.	1843. Red Kid- neys.
	lbs.	lbs.	lbs.	lbs.	lbs.
No. 1.—Potatoes taken from the regular heap, without any preparing, planted 2 feet from row to row, and 9 inches from set to set, the furrow drawn with the hoe, and manure put in the furrow, on the sets, the eye of the potato nearest the surface	70	116	98	90	103
No. 2.—The potatoes taken from same heap as No. 1, the sets put down the same, but the furrow made and the covering performed with the breast plough	76	128	106	101	112
No. 3.—Planted precisely the same as No. 1, but prepared by being taken up before they were quite ripe, and exposed to the sun three weeks before housing	85	143	109	114	119
No. 4.—Prepared as No. 3, but planted with the eye nearest the bottom of the furrow, which was made with the breast-plough	113	159	130	132	149

A regular increase is shown by this table, and that with five distinct kinds of potatoes, and in five different seasons, according as I applied more of the rules which I have recommended above.

In No. 2, the substitution of the breast-plough for the hoe, by giving a firm bed to the potatoes, produces an increased yield of each kind in each year. In No. 3, the use of unripe seed gives a further increase throughout upon No. 2. Again, No. 4 surpasses No. 3 each year, all other things remaining the same, but the eye being turned to the bottom of the furrow. This steady increase in yield, progressing in accordance with the rules laid down above, gives me great confidence in proposing their adoption. These experiments were made on a piece of poor sandy soil, very apt to run together and get baked on the top after heavy rains. The Ash-leaves were each year planted the last week in March, the Prolifics the third week in April, and the other sorts the second week in May.

Hoeing is a thing that is not in general done as it ought to be. We very often see two horses with a plough between rows of potatoes not more than 2 feet apart; sometimes the horses tread on the plant, sometimes the plough slips aside; and when this is not the case, if you walk along behind the plough you may see large masses of the fibrous roots of the potato exposed to the scorching sun, and often torn off. Now nature teaches us, and experience teaches us, that this cannot be right, when we might get them hoed in the very best manner for 18s. per acre, that is, 6s. each time of hoeing; and I can with confidence assert, that if manual labour was substituted for horse-labour in this particular, the remuneration would be full 30 per cent. above that of horse-labour. Our own practice is to hoe them slightly as soon as we can see the rows of plants above ground, and again in about eight or ten days. If the planting is performed with the breast-plough and in dry weather, there is no occasion for the hoe to go more than an inch and a half deep, just to loosen the surface and to destroy weeds. The third hoeing or earthing is performed in about the same time after the second as the second is after the first. The plan of earthing potatoes 6 or 7 inches high is bad, because the fibrous roots of the potato extend themselves a great distance from the set, and by drawing the mould from between the rows to earth up the stems, a great number must be cut off or exposed to the sun. The only real benefit derived from earthing up potatoes is, first, to keep the wind from breaking them down, and thus hold the stems erect; secondly, to keep the tuber from being exposed to the influence of the weather. When it is approaching a state of maturity 2 inches are quite sufficient for those purposes, but the wider the bank extends the better.

Hoeing potatoes is a very great help to their vegetative powers, especially on those soils that are apt to cake on the top after rain; whether from admitting air to their roots, or from allowing the

evaporation * emitted from the soil to unite with the atmosphere about the plants, I cannot positively say, but I strongly suspect the latter is the cause of such a difference being effected in so short a time by the operation. However this may be, it is quite certain from experiments that I have made, that there is no operation that is practised in cultivating the soil which better repays the cultivator than judicious hoeing; and yet there is scarce anything so much neglected!

The best soil for potatoes is a rich light mellow sand or brash, enriched with manure. But if we have none of these at our command, we must endeavour by artificial means to render what we have as similar as we can. Some few years ago, when in Cheltenham, a gentleman laid me a wager that I did not grow 9 pecks of potatoes from 9 rods of ground, and that what I did grow would not be eatable. The land was a complete clay-marl, having had all the top loam taken off two or three years previous. The gentleman had planted potatoes on it once in the usual way, and met with a complete failure. I proceeded in a manner not known in that neighbourhood, and was laughed at for my experiment. About the beginning of March I got a good cart-load of unfermented horse-dung, which cost 7s.: this I had well dug in among the soil, and left the top as rough as possible, for the sun and air to pulverize it. I left it in this state until the second week in April, which happened to be very fine; I then levelled the surface, and marked it out in beds 6 feet wide; down the beds I put two rows of potatoes about 3 feet apart and 6 inches in the row; between the beds I dug out trenches, the same as for celery, and covered the sets about $4\frac{1}{2}$ inches deep; they were kept well hoed, and what was the result? Why, instead of 9 pecks of useless potatoes, I had $7\frac{1}{2}$ sacks of most excellent ones; the sorts were the ash-leaf kidney, the prolific, and the gold-pine. I got the crop off in August, and immediately sowed store-turnips on one half, and planted the other with kail, and in November I had the satisfaction to see a most excellent crop of turnips and kail on the same piece of ground, being the second crop the same season on the land that I had been told in the spring would produce nothing; and I am quite certain there are thousands of acres now pronounced valueless, that might be turned to good account in the same manner with little expense beyond what would be repaid the first year or two.

Whatever may be said against unfermented manure by theorists,

* I have always found that a few handfuls of maiden loam strewed among plants that are sickly and their foliage turned yellow, will in an almost incredible short time restore to them their dark green healthy appearance; neither have I ever found any other substance that works the same effect in so short time, not even charcoal itself.

I am quite convinced from practice that there is nothing better to bring heavy tenacious soils to a proper state of friability than to apply manure or farm-yard dung in as fresh a state as possible, because, while in a state of fermentation in the soil, it keeps the pores open, and the soil in a state of activity. On the contrary, manure cannot be too rotten to be applied to brashy land for potatoes. Peat or turf ashes are an excellent manure for potatoes; spent hops, too, scattered on the sets at planting have been found to be a great stimulant, and to produce large crops.

It would be a difficult task to point out the best sorts of potatoes for all soils and situations, and palates; but as a fair criterion I should say, the qualities most necessary to constitute a good potato are first, a mellow mealiness, not having a hard core in the middle when cooked; secondly, a fine rich flavour; thirdly, fineness of texture; lastly, good croppers. There are but few to be found possessing all these qualities: the first three are possessed by the China-Orange potato, but it requires very good soil to make it a good cropper; the first and the last are possessed by the Noblow, but it is deficient in the second and third: it is, however, a most excellent potato for poor brashy land: people here prefer them to the Purple or the Red-nosed kidney for general use.

The best sorts that I have found are for early ones Ash-leaf Kidneys, and for seedlings: those are in good eating from June till September; secondly, Early Prolific, Goldfinders, and China-Oranges,—those are in good eating from August till December; late, Devonshire Reds, York Reds, Round Black and Purple, and Noblow,—those are in good eating from November till April; very late, French Magpie, Red Kidney, and Red-nosed Kidney,—these are in good eating from April till August; there is also a kidney potato called Chapman's Early, which, if planted in June and taken up in October and stored in mould, will equal the best new potatoes from October till May, in flavour and appearance. There are innumerable other varieties: but having tried some hundreds, I can find none to surpass those I have enumerated.

There are four or five sorts of potatoes commonly grown to feed cattle, which are called the Purple-cut, the White-blossomed, the Mangold-wurzel potato, and the Prince de Rohan. Now the Noblow is a better cropper than either of the first two, and a better potato than the last two. Some one will say, perhaps, All we want is the best croppers for feeding cattle; but this is a mistake. The wholesomeness of the potato depends on its mealiness; for whatever may be the component parts, easiness of digestion is the great requisite of the potato; for instance, in a chemical examination two varieties of potato shall possess the same quantity of mucilaginous or nutritive matter; one will fall to pieces when

boiled, and the other will cut like a piece of soap; that one which falls to pieces is to all intents and purposes more wholesome than the other both for man and beast, because its nutritious matter is more readily imparted.

An experiment that I made some time ago proved to me the correctness of this opinion. A large hog, fed on 3 bushels of Noblow potatoes mixed with 1 bushel of barley-meal, improved in weight in fourteen days 29 lbs.; the next fourteen days it was fed on the same quantity of Mangold-wurzel potatoes with 1 bushel of barley-meal, and only improved 21 lbs.; on being allowed Noblow potatoes in the same proportion the next fourteen days, it improved in weight 34 lbs.; it was weighed each time before breakfast on the fourteenth day; other experiments made proved the decided superiority of the mealy potato. The Mangold-wurzel potato is an immense cropper on very rich soil, but when brought on poor brashy soil the Noblow yields a far greater weight.

So much for sorts and quantities. We come now to preserving them for use in the winter and early summer months.

There is a very great mistake in the common way of preserving potatoes for use. We very often see potatoes dug in wet weather, thrown into a waggon or cart, and thence into a heap, as if they were so many stones. This is a great mistake. Potatoes ought to be handled as tenderly as eggs, if possible; for when thrown heavily about just when fresh taken up, it bruises them so that they are not fit to be eaten or seen. Then we see people laying a great quantity of straw next the potatoes, and afterwards covering them up with a large quantity of mould, which they beat as if they were puddling a pool: this, too, is wrong. It is well known that potatoes heat if laid in a heap as soon as they are taken up; the steam is kept in, the straw becomes wet, and very likely mildew or some other species of fungus follows, and the destruction of many of the tubers is inevitable. I have seen hundreds of such cases in which the potatoes have been more or less affected, some to the extent of nine-tenths of the whole heap quite spoiled. I beg, then, to suggest a simple method which we have practised many years, and by following which all these bad consequences may be averted.

Never raise your potatoes in wet weather, but always choose a dry time for the purpose; let them be perfectly ripe if intended for eating; handle them as gently as possible; choose a dry situation for the heap; lay them long and narrow, not allowing the bottom of the heap to be more than 4 feet wide; lay the tubers in ridge-ways as neat as possible; then cover with fine mould, but do not on any account put straw next the tubers, nor beat the mould hard, but let it lie as light and hollow as possible. By this means the rank steam is allowed to pass off, and the air to

purify the atmosphere within the heap. A trench should be dug round the outside of the heap at least 6 inches deeper than the bottom of the heap, which will drain it in case of wet; nothing is more injurious than the water lying about the bottom of the heap. A sort of thatch should be put on the outside of the mould about the beginning of December to keep out the frost, but should be removed quite as soon as the beginning of March. Late potatoes may be kept fresh as when dug till the beginning of May by this practice, when they may be taken away, and put into any dark and cool place till used.

I should not have troubled the Society with this short Essay but for the complaints which are so very common about curl, Bobbing Joans, rot, &c. I do say, and it cannot be too strongly urged, that half the failures in the potato crop might be avoided if proper care was taken in cultivation, preservation, and selection for seed.

How common it is to see a field of potatoes, in a wet situation, just put in with the horse-plough, without any regard to the selection or the manner of planting, without stopping to inquire whether the plant requires a light soil or a heavy one, a dry situation or a wet one, whether the soil should be hollow or close,—there they are planted! If a failure ensue, it is imputed to a bad season or bad soil, or the disease called the curl is said to be in the ground; but there is no glance at the real cause—bad cultivation.

I can assure my friends in the low counties that if they would take a little more pains to ridge their wet and adhesive soil, so that the potatoes may stand out of the water, to use the best means of making the soil light and friable by turning it in dry and frosty weather, and by mixing with it unfermented manure; if they were a little more particular in choosing their seed; if they were a little more particular in choosing a dry time for their operations; if they were more particular in choosing a good dry situation for preserving them in; I can tell them, from practical experience, that we should not hear one quarter so much about failures, curl, rot, or anything of this sort; and I can say, from practical experience, that their additional trouble would be repaid 100 per cent.

Much has been said and written about picking off the blossoms from potatoes, but a question arises, whether it will pay? I can positively say it will not.

I have no doubt that if we could manage to get the blossoms picked off without deranging the foliage, or otherwise disturbing the plant, it might make a slight difference in the crop. But if we come to consider that at the time when the blossom is formed the plant nearly covers the ground, we shall find that we cannot send boys or women amongst them to gather the blossoms without very much injuring the foliage and otherwise deranging the plant.

Thus much for opinion, but practice is real evidence. I have very frequently tried the experiment on one half of a bed, leaving the other half not picked off, and could never find any difference in the produce, the injury done in picking off the blossoms quite balancing the good that the tuber derives from the absence of blossoms.

The cost of planting an acre of potatoes properly with the breast-plough, 2 furrows deep, is about 25s. 6d. : three times hoeing at 6s. each time, 18s. ; taking up and securing in ordinary soils, 25s. The quantity of tubers required to plant an acre, if middle-sized, about 12½ cwt. ; if large, 14 cwt.

If manure is used it should be spread equally over the ground : the extremities of the fibre reach a long way from the set, and it is these that take up the food. When the manure is put in the row on the sets, as is usually done, if it is pretty well charged with ammonia, it burns the young fibres just as they are emitted, and consequently they are of no use in taking up food for the plant. I have examined hundreds of sets that have been spoiled in this way.

In low, cold, wet, and adhesive soils, where it is necessary to use unfermented manure, and to cast the land into ridges, it is best to dig or plough it in previous to planting, and at planting time to level the ground. Plant in rows on the surface, and cover with the soil that is taken out of the trenches ; the expense is about the same as breast-ploughing, or but a trifle more.

It has been recommended to plant potatoes on hillocks in preference to this mode : I cannot discover the advantage by experiments that I have made, but have always found the difference in favour of the rows.

The mode of cooking potatoes by steam is, I think, the best ; but if this convenience is not attainable, the water should be drawn off a minute or two before they are soft, and a little salt strewed over them, and covered close a few minutes, which will greatly improve the flavour and the wholesomeness of the potato.

In the modes of cultivation which I now recommend, I have adduced nothing but what I have proved by practical experience ; neither have I recommended anything that is unattainable or expensive, beyond the reach of the smallest means.

Longfords House, Minchinhampton, Gloucestershire.

XXX.—*Experiment in raising a Crop of Swedes upon barren Land with artificial Manure.* By the Rev. A. HUXTABLE.

To Lord Portman.

MY DEAR LORD,—I have not failed to bear in mind the wish which you did me the honour to express that I should send to the Royal Agricultural Society an account of my attempt, which has

proved so successful, to raise a crop of swedes upon land of certainly most unpromising character. Although I cannot feel any confidence that the statement of my plan and its calculations will be deemed worthy of insertion in the pages of the Society's Journal, yet I venture to submit all the particulars, that the experiment may, in the event of its being published, be intelligible to all readers, even to those, if such there be, who have not yet given their attention to 'Chemistry in its Application to Agriculture.'

The problem which I sought to solve is contained in the question—"Can we by supplying to the soil the constituents (so far as at present known) of a plant, cultivate that plant on any land, however in itself sterile?"

The portion of ground chosen for the testing of the principle here implied was, as your Lordship will recollect, situated in the parish of Sutton Waldron, in Cranbourn Chase, very steep, exposed to the south, but sheltered in some degree by the hills of which it forms a part, almost covered with white rubble, forming a portion of the "upper chalk." This precise spot, consisting of five acres, was selected because it appeared the most barren and "unlikely" of any in the immediate neighbourhood. In truth, the endeavour to grow swedes on such land appeared to all observers an *experimentum crucis*. So long as it lay in down, scarcely any herbage whatever covered this hill-side. On the failure of the hay-crop in 1844, a party of poor men from Shaftesbury came to me soliciting employment. They were set to dig this piece of land, but the soil proved too thin and stubborn for the spade; they therefore, in their own phrase, knocked it over with the pickaxe. Twice in the season afterwards it was sown with rape, but the produce was nothing. A soil of this constitution seemed a fair field for the experiment on a pretty large scale and in a *popular* way—I say "in a popular way," because, to satisfy the requirements of rigid science, a strict analysis both of the soil and manure would be asked for, before any inference would be permitted to be drawn from the result. Yet for practical purposes it may seem enough to show that, on land growing nothing, a large crop can be raised by adding certain ingredients which the chemist tells us are necessary for the fruitful cultivation of that crop. Accordingly in the latter part of April, 1845, I determined on this hill, as above described, to see whether it were possible to produce a crop of swedes weighing 20 tons per acre. To effect this object, chemical analysis, as given in Professor Johnston's Lectures, acquaints us that there would be required for the bulbs and tops of such a return (*i. e.* for 20 tons of bulbs and 5½ tons of tops) inorganic matter weighing more than 500 lbs.; consisting of about 146 lbs. of potash, 76 lbs. of soda, 69 lbs. of sulphuric acid, 30 lbs. of phosphoric acid, 103 lbs. of lime, 22 lbs. of magnesia, 23 lbs. of chlorine,

23 lbs. of silica, as well as a certain proportion of organic matters in the form of ammonia and carbonic acid. It was expected that if these were sufficiently supplied to the plant in its early stages, the remainder of the carbonic acid and ammonia necessary to the perfect swede would be furnished, whether, as Mulder affirms, from the decaying matter in the soil (especially the sawdust mentioned afterwards), or from the ammonia brought down by the rains according to Liebig. The quantities of inorganic substances above enumerated are not constant, but vary, as is well known, within certain limits, according to the soil: they must be considered as only an approximation to the quantities and proportions required.

Now as potash and soda may to a great extent replace each other, I calculated that 30 bushels of woodashes would give those alkalis in sufficient measure. I made no provision for the alkaline earths, for the chalk soil would plainly yield lime enough; to this I trusted to replace the minute dose of magnesia demanded. The phosphoric and sulphuric acids would be found amply in the 2 cwt. of Ichaboe guano, 50 lbs. of burnt bones treated with 25 lbs. of sulphuric acid in addition to the sulphates and phosphates contained in the woodashes. The guano would also yield sufficient ammonia to the *young* swede-plant; whilst two pot-load of sawdust already in a rotten state, having been fermented by pigs' manure and salt, would give out a constant supply of carbonic, as well as conduce, according to Mulder, to the constant formation of ammonia in the soil. The great affinity of decaying sawdust for moisture would prevent the effects of drought so formidable to turnips on our high chalk-lands. The opposite danger of excessive rains washing the manure away from the growing plants was guarded against by pouring over the guano and ashes employed 10 lbs. of sulphuric acid in a diluted form, thereby converting the highly soluble carbonates into the comparatively insoluble sulphates of ammonia and potash.

In order that every portion of the manure thus calculated might, as far as possible, be duly apportioned to each plant, it was determined to bury both the seed and manure in holes at measured distances; but the looseness of the soil, filling up each hole as soon as made, defeated this expedient. The labourers were then instructed to begin at the highest point, and working down hill to strike out with their hoes small drills 2 feet apart. The manure having been previously hauled to the summit, a large wheelbarrow, loaded with a sufficient quantity for two drills, was wheeled down the interval between the two drills; and a handful of the contents placed at distances of one foot in each drill. Children followed dropping upon each deposit of manure three fingers-full of seed mixed with fine soil, which served to prevent the manure from burning the seed. In descending the

hill they trod on their work, and so buried both the manure and seed together. This operation completed the process: the only subsequent cultivation consisted in the singling by children of the swedes as they came up in bunches.

The issue of this experiment has exceeded my most sanguine expectations. Forty perches of the best part of the crop yielded of *clean* roots after the rate of $23\frac{3}{4}$ tons per acre, whilst 40 perches of the poorest gave 19 tons. On comparing the relative quantities of the heaviest and lightest produce, competent persons have estimated the crop at 21 tons per acre of clean roots, the samples of which were weighed in dry weather. Some of these when topped and tailed weighed 14 lbs., measuring severally 29 and 30 inches—many hundred of them exceed 10 lbs. in weight. One remarkable circumstance presented itself to the observer. Between swedes of 8 lbs. and 9 lbs. weight would be seen every now and then a starveling plant in bulb not bigger than a marble. This arose from the carelessness of the children, who occasionally dropped the seed at a distance from its appointed food. But the accident served to prove beyond all doubt at once the efficiency of the manure and the intrinsic poverty of the ground.

When I began this experiment the men employed on it and every eyewitness who passed by smiled incredulously at what appeared at the time an act of well-meant folly—but *now* the success can no longer be denied, and the last refuge of scepticism betrays itself in the question so often put to me—"But what was the cost? You may buy gold too dear."—Of course this is a most important part of the subject, and I rejoice, for the sake of the labourer begging for work and the nation for food, that I can answer the inquiry most satisfactorily. Thus stands the cost per acre:—

	£.	s.	d.
30 bushels of woodashes at 6d.	0	15	0
2 cwt. of Ichaboe guano at 7s. 6d.	0	15	0
50 lbs. of burnt bones and 22 lbs. of sulphuric acid	0	7	0
30 bushels of sawdust	0	2	6
Labour account* in hoeing, drill, dropping seed (the surface of the land being otherwise untouched).	0	19	6
10 lbs. of sulphuric acid poured over ashes	0	1	3
Rent 5s.; rates, &c., 2s.	0	7	0
Seed, 5 lbs. per acre, 1s.	0	3	6
A pair of horses hauling the artificial manure to the summit of the hill	0	7	0
	£.	3	17 9

* The expense of preparing the ground is certainly part of the cost: though it had been prepared previously, it had not borne any crop. This would add considerably, but most properly, to the expense. For an acre pecked up at 6d. per rod, besides harrowings, &c., 90s. per acre would be the probable expense.—T. KIMBERLEY.

It will be observed that no charge is made for pulling the swedes, because 4 or 5 tons per acre of green food (though some of the leaves were in a state of decay), which have with the addition of a little straw maintained a flock of 120 ewes for five days, must far outweigh that expense, and in truth ought to convey a considerable sum to the credit side of the account. I have thus given every item of cost that can be laid against 21 tons of swedes per acre. The precise value of this root is, I am aware, hitherto an undecided question. In this neighbourhood I can sell them at the rate of 1*l.* per ton; but experiments made last year and others still in progress lead me to value them at 9*d.* per cwt., at the very lowest—or 15*s.* per ton when employed in fattening sheep in sheds on boards; and this exclusive of the value of the dung made by the sheep under cover. Therefore I do not hesitate to express an opinion that to persons who know how to use *swedes* they are worth 15*s.* a ton—an estimate which makes the crop worth 15*l.* 15*s.* per acre, at a cost of 3*l.* 17*s.* 9*d.*, giving a return of more than 300 per cent. for the outlay.

I hope that it will not be thought an instance of too rapid a generalization when I draw from this experience the inference that with a *skilful* employment of labour, reliance on the principles of chemistry, and adequate capital, there is no soil, however poor, which will not abundantly repay the costs of cultivation.

I am well aware that the estimate of “10*s.* a ton, or of 15*s.* at the very outside,” is that given in many books. Nor would I presume to express my own higher sense of their worth, but that continued experiments made by myself have left me no doubt on the subject. Will you permit me to observe that the want of accurate weights and measurements, and therewith of just valuation, is the great opprobrium of English agriculture. In this respect it is far less scientific than either the French or German. I have never yet met with a farmer who could tell me with any degree of exactness how much of food per day, an animal, whether sheep, or pig, or ox, will eat, under given circumstances of age, breed, condition, and shelter; and how much flesh he will put on by the consumption of so much food. Therefore I have determined to seek out the information for myself; and am prepared to prove, by repeated weighings of the food, that a full-mouthed south-down wether or ewe will, when confined to a shed upon boards, as in Journal V. Part i., eat on an average from 16 to 18 lbs. a day of cut swedes, with 1 pint of oats and $\frac{1}{2}$ lb. of barley-straw cut into chaff and salted, and that upon this food the animal will increase 3 lbs. in live weight per week. Now I assume that this live INCREASE (in a full-grown animal) is to the dead-weight :: 4 : 3, because skin, head, bones, and entrails will be nearly a constant quantity.—

	s.	d.
∴ Dead weight = $\frac{3}{4}$ of 3 lbs. = 2 lbs. 4 oz. at 7d. . .	1	3 $\frac{3}{4}$
Deducting 7 pints of oats at 3 $\frac{3}{4}$ d., attendance $\frac{1}{2}$ d. . .	0	4 $\frac{1}{2}$
	<hr/>	
	0	11 $\frac{1}{2}$

This 11 $\frac{1}{2}$ d. will represent the value of the swedes consumed per week, that is $7 \times 17 = 119$ lbs.

∴ If 119 lbs. = 11d.
112 lbs. = 10 $\frac{1}{2}$ d.

or a ton is worth 17s. 6d. *exclusive* of the manure.

Nor, my Lord, is this estimate unsupported by scientific authority. I beg to refer to an experiment detailed by Professor Playfair, *Agricultural Gazette*, p. 59, 1844—where it is shown that under certain conditions 100 lbs. of swedes gave 3 lbs. of live weight. Also to the very interesting experiments of Mr. Curwen, in his ‘*Agricultural Hints*,’ showing that Mason’s Leicesters, fed on turnips, would make the crop worth 30l. per acre, meat being at that time 6d. per lb. in the year 1808.

I confidently hope that you will excuse the length of this letter, as I am most anxious to secure the attention of the great agriculturists to this question—“What is the value of the swede crop under given conditions?”

I am, my dear Lord,

Your faithful servant,

A. HUXTABLE.

Sutton Waldron, Shaftesbury,
November 11th, 1845.

To determine the value of the dung resulting from the consumption of a ton of swedes by sheep under cover, eating a pint of oats to every 17 lbs. weight of turnips:—

The ash contained in one ton of swedes . . .	17 lbs.
The ash in the oats is in weight about one-fortieth part of the grain, and as 75 lbs. of oats will be eaten with the ton of swedes . . .	2 lbs. nearly

The ash will amount to 19 lbs.

Now the whole weight of dung from swedes will be about one-tenth of weight of roots . . .	224 lbs.
Weight of dung from corn is nearly one-half; therefore, from the oats there will be . . .	37 lbs.
	<hr/>
	or 261 lbs.

s. d.

The Nitrogen in this manure, according to Bous-
singault, 'Economie Rurale,' tome ii. p. 148, is 1
and one-tenth per cent. nearly, or in the above 261
lbs. will amount to $2\frac{3}{4}$ lbs. nearly, which, at 7d. per
lb. (its value when bought in good guano or sulphate
of ammonia) 1 7 $\frac{1}{2}$

The ash, considering how large a proportion consists
of potash and soda, &c., may fairly be estimated at
1 $\frac{1}{2}$ d. per lb., or 19 lbs. 2 4 $\frac{1}{2}$
Nitrogen, as above 1 7 $\frac{1}{2}$

3 11 $\frac{3}{4}$

This being added to 17s. 6d. per ton as the value of the bulbs esti-
mated by the amount of mutton they will produce, gives 1l. 1s. 3 $\frac{3}{4}$ d. as
the whole value of a ton of swedes consumed in the manner and under
the conditions of the experiment.

XXXI.—*On the Breeding, Feeding, and General Management
of Sheep.* By T. E. PAWLETT.

It is not my intention, in offering the following pages to the notice of
your Society, to enter into a lengthened discussion derived from
a speculative knowledge of the subject in question, but I shall en-
deavour to confine myself chiefly to the relation of experiments
which have been made and tested by myself, offering at the same
time such remarks and observations as may have occurred to me
whilst they were in progress: and here I may observe, that the trial
of any of them was not left to the care of another person, but all were
begun and carried on under my own eye, as far as circumstances
would allow. It has been my practice for more than twenty years
to weigh some of my sheep monthly, almost all the year round, to
try various kinds of food and methods of management, and always
in the most accurate manner, by using dead weights, and not upon
the steelyard principle, which, by weighing anything alive, is liable
to great variation. For instance: if I were to weigh a lot of lambs
alive, which I frequently have done with the common steelyard,
by taking two saddle-girths, and placing them under the belly of
the animal, one as near the hind legs as possible, and the other
immediately behind the fore legs, and so when the steelyards were
attached to the girths, suspending the lambs from a pole rest-
ing upon the shoulders of two men, I have invariably found that
they would weigh by this method from 3lbs. to 4lbs. each more
than they afterwards have done (on the same day) by scales and

weights. I have also endeavoured to weigh my sheep as nearly at the same time of the day as I possibly could. I believe in all trials of animals a number should be taken for the experiment, and never less than six or eight. I generally, in the following accounts, have selected eight lambs, as it is the average of the lot that must be looked at, and not the individual increase of any one of them. It is astonishing sometimes to find so much variation as I have seen among a lot without any apparent cause; some may not have been in good health when the weighing day came, have had a little scour upon them, and others may not have taken so much food as usual. The sheep with which the following experiments were made were all of the Leicester breed, and bred by myself. Being a ram breeder, perhaps it will be received with some suspicion when I state, that it is of the greatest possible advantage, in order to get a good breed of sheep, that the very best rams should be procured; nevertheless it is true, for I have had abundant proofs that the produce inherit considerably more of the qualities of the male (whether good or bad) than they do from the female; indeed, I consider the male almost everything in getting a good animal: I do not, however, wish to be understood that the properties of the female are quite inactive in the process of generation, and that the produce does not in a measure partake of her qualities. I would recommend that the greatest care should be taken in drawing the ewes for the rams, so that whenever there is a defect in the one, it may be counteracted by the others possessing good points in that particular. Great difference of opinion exists whether it is right or not to cross animals in breeding. By crossing I do not mean mixing two distinct breeds, but changing from one flock to another of the same breed; many are the advocates for it, whilst a few persons contend for breeding in and in. From a long experience and close attention to the subject for more than twenty years, my mind seems more disposed to favour the latter than the former. I do not, however, recommend that animals closely allied by blood should be put together generally; yet I have known very good sheep, for instance, produced by putting the son of a ram called A to a daughter of A, in cases where their points would suit each other; and I should never hesitate in doing so. I cannot see the utility of crossing for the sake of crossing or changing, unless I can perceive superior qualities in another person's flock which mine do not possess; even in that case if my neighbour's flock were not quite so well bred as my own, I should long hesitate before I had anything to do with it, as the more I see of breeding the more I am convinced of the advantages to be derived from using well-bred, indeed the best-bred animals.

In the breeding of sheep there is much to be attended to—size, wool, constitution, quality of mutton, form, &c.; yet I think pro-

pensity to fatten of paramount importance. Having drawn the ewes for the rams, the next point to be considered is, which is the best method—To turn the rams loose amongst the ewes in the common way, or put them in stocks for the rams. I invariably adopt the latter, as I get far fewer “guest” or barren ewes by this than I should by the former practice. It very frequently happens that rams are put loose with the ewes when they are much too fat; many are therefore very idle, and will not tup an ewe unless under favourable circumstances; they may serve some; and jump others, and if they cannot succeed after two or three trials, will leave the ewe entirely and go to another; she misses this time, and perhaps also when she returns again. When ewes are served in stocks, the shepherd of course sees that all is done right. The general opinion is, that once serving an ewe is sufficient for her to be inlambd: experience has convinced me that twice is much more safe, and I will adduce an instance of it, which led me to the custom which I always adopt, of having all my ewes served at least twice by the rams. On the 17th of October, 1835, I put 31 ewes to 5 different rams; 22 of them were tupped twice each, a few hours elapsing between, and at the usual time when they would have returned, had they not been inlambd, only one did return. The remaining 9 ewes were tupped by the same rams only once each, and 5 of them returned or went over again. From this it would appear, that out of 100 ewes served twice, 95 would be inlambd; while out of 100 served only once, 45 only would be inlambd; showing a decided preference for stocking the ewes, and having them tupped twice. I have been accustomed for many years to set down daily every ewe that went to the ram, and find that they return, if not inlambd, at from fourteen to eighteen days afterwards; scarcely any come again before fourteen days, and very rarely any later than eighteen days. I found by observations made in the lambing seasons of 1831 and 1832, that my ewes went with lamb as follows, and I was enabled to come to a certainty upon this point, as I always number my ewes, also my young lambs, and set down every day the ewes as they take the ram:—

	Weeks.	Days.
The longest time any ewe went with a ram lamb was	22	4
The shortest time	21	0
The longest time any one went with an ewe lamb was	22	2
The shortest time	20	4

This proves the general opinion to be correct, that animals go with young longer with males than females, but the difference is very trifling.

It is the custom in many parts of the country to dress ewes with mercurial ointment in the autumn, whether they are infected with

the scab or not; and a question often arises in the minds of some persons how late in the season, when the ewes are perhaps heavily inlambed, such operation may safely be performed without any injury arising to the young lamb within. In the autumn of 1834 my ewes were lined or dressed with ointment in the usual way; but in consequence of some apprehensions that they had caught the scab some time after they were dressed, or might break out with it in the spring, I determined upon giving them a second dressing, which was performed on the 9th and 10th of January, the ewes being considerably more than half their time gone with lamb. They were turned upon their sides as usual to be dressed, but no lines were put down the belly of the ewes. I found that no injury arose from the dressing, as they lambed quite as well, and the lambs were as healthy as usual. I had one ewe lined a third time, to try whether the ointment would affect her, being inlambed, which was done on the 10th of February. She yeanned a lamb quite healthy on the 23rd of March. I believe dressing with ointment does not affect old sheep so much as lambs. A few years since I sustained two or three great losses from my lambs having been dressed with mercurial ointment. The weather setting in very hot some days afterwards, the greatest part of them were attacked with inflammation, and many died; in one case they were lined with ointment about the 11th of October, and in the other about the middle of February.

When ewes are with lamb they are very susceptible of taking cold, and due attention should be paid to them that their lair is clean and dry, particularly a few weeks before the lambing season commences. If they are allowed to remain in wet weather on the turnip land when it is very dirty, in many cases the loss will be great, which I have proved from experience. In the winter of 1832 all my ewes were put to turnips, and remained upon them until the 1st of February. Having bought this year a quantity of high-priced ewes, I drew from the flock 21 of them, and kept them on grass land, and they were fed daily with turnips from the 1st of February; the remaining part of the high-priced lot of 35 were left with the flock upon the turnip land, and fed in the common manner, the land being exceedingly wet and dirty nearly all the month of February. About the end of that month those on the turnip land began to cast their lambs before the proper time, and those ewes which went their full time, many of them brought dead lambs, and of those that came alive many died a day or two afterwards; whilst those 21 ewes which were kept on grass were healthy and went on well: 18 of them lambed by the 1st of April and had 16 lambs alive. From the 35 ewes kept on the wet land 5 were guest, 30 had lambs, and only 11 lambs were alive from them on the 1st of April.

It is also highly necessary to keep the ewes well, and they should have some dry food, either corn, hay, or clover chaff, at least three weeks or a month before lambing, to force their milk and keep them in a healthy state, or there will in many cases be much loss with the young lambs. Before I kept my ewes well I lost many lambs when young, it being my usual custom to keep them on Swede turnips. A few years ago I determined to keep them better, by giving them with the turnips plenty of good hay every day for three or four weeks before they lambled. I tried this plan with the first 100 ewes that were to lamb, and I scarcely lost a lamb out of the 100 ewes. The next lot of 100 ewes were kept on Swedes, which had been eaten off to pecking during a snow by other sheep, the ewes eating the part pecked up without any other food, and the consequence was that a great many of the lambs died. They generally came alive, but died in two or three days afterwards, being weak and unhealthy in their appearance. I lost as many as five or six lambs a-day sometimes, and I believe from no other cause than not keeping their dams well before lambing; those lambs which lived did not thrive well being short of milk: it is of little use to keep them well after lambing if the milk is not forced before. When a lamb dies, and another is intended to replace it, I let the dead lamb remain with the ewe for about a day before it is removed; it is then skinned, and the skin is fastened on the lamb which is intended to be put to the ewe, which may be fitted very well if the skin is taken off the lamb by a skilful hand. The lamb being then put to the ewe, she will generally take to it in a few hours if confined in a small space.

Dipping lambs in the summer in a composition of arsenic and soft soap is become very general, and I believe is very advantageous to the lambs' progress; this should be done early in May, as the lambs will suffer much from the ticks if delayed until they are weaned, which often is not before July. Care should be taken to have the mixture from a druggist. I have known much loss from dipping where people have mixed the composition themselves. As the expense is trifling, I would recommend that the lambs should be dipped a second time when they are taken from the ewes, so that they may be clean from ticks during the winter. I never found it to be the least injurious to my lambs, but think they appear to thrive much better after it.

Much difference of opinion exists as to the proper time for weaning lambs. No inconvenience would arise from weaning early in the season, provided the lambs have good, proper, and sufficient keep; this I proved in the year 1837. I weaned a few lambs on the 10th of June, weighed them, and after they had remained a few days on the land they were accustomed to, I took them to a pasture of sainfoin; some green tares and water were

given to them; they were weighed again on the 10th of July, and I found they had increased in weight $16\frac{1}{2}$ lbs. each. Another lot of lambs were weighed on the 10th of June, and continued with the ewes on good white clover; the lambs had, apart from the ewes, in a pen, tares and water given to them; these were also weighed again on the 10th of July, and gained only $12\frac{1}{2}$ lbs. each, showing a difference for early weaning, of $3\frac{1}{2}$ lbs. each lamb on the average; the weather was very hot and dry all the time. After this trial they were put together, and continued to be fed the same through the winter. Both lots were weighed again in the February following, when I found that those weaned early gained in weight $5\frac{1}{2}$ lbs. each more than the other lot, which proves that lambs weaned early winter the best.

The weaning of lambs properly, and their subsequent treatment, is one of the most important branches in the management of sheep. If they are not attended to at this critical period very frequently they will soon go wrong, and the loss be very great; they will have a fever upon them; many will die, and those that survive will not get over it for many months. I have found the following recipe (extracted from an old book on farming) of great benefit to lambs when they scour, and I am never without it:—

Epsom salts 6 ounces.

Nitre, in powder 4 „

Boiling water 3 pints.

Pour the water hot upon the salts and nitre; with new milk (warm) add spirit of turpentine, 4 ounces; bol ammoniac in powder, $\frac{1}{2}$ an ounce; mix and shake them well together. If necessary repeat the drink every day or two. About 3 or 4 table spoonfuls may be given to a sheep for a dose, and lambs in proportion to their size.

I would recommend the manner which I adopt with my lambs when they are weaned, which is always to leave the lambs in the pasture that they are accustomed to for a few days, and take away the ewes to another and a distant close, that the lambs may not hear them bawl; if this be attended to they will lie quiet, and scarcely trouble themselves about their dams, but will disperse themselves over the pasture; whereas in the common way, by taking away the lambs to a pasture they have not been used to, they will lie at the gate they are put in at, fret and bawl, eat scarcely anything, and if the weather be unfavourable, and the pasture not suited to them, will frequently go the wrong way. I prefer old keep, which has been eaten in the spring, whether sainfoin, red clover, or grass, to any of these that has previously been mown; but I believe no food so injurious to young lambs at this time as old white clover stubble, which is generally in a dry state in the month of July, and will very often cause them to scour very much, and consequently be in

a feverish state. Water should be given to them if the weather be hot. Those who wish to get a few lambs very forward for any particular purpose, may give them some early cabbage or green tares upon the clovers, or indeed it would pay in a general way to keep the wether lambs well, if it is intended to get them fat for the butcher the following spring; they will get very fat if managed in this way. It is also very advisable to shift lambs about (I am now alluding to the general flock) from one pasture to another, and not let them remain for more than a week or ten days at a time in any one place; by so doing they keep more healthy, and are less liable to scour.

It is a great advantage to the young lambs to get them to either cabbages or turnips early in the autumn, as they will winter much better by getting used to their food before the wet cold weather sets in, and some dry food should always be given to them at this time, until at least they have sufficiently taken to the food upon which they are to remain for some time. Malt-comb, or clover hay cut into chaff are excellent for the purpose, and much better, I think, than corn so early in the season, as the roots early in the autumn are in a succulent state and very feeding. If corn and cake are intended to be used for the lambs, they ought not to be given to them until after Christmas. Cabbages planted out in April or May are the best food to make lambs fat that I ever met with: but they are an expensive root, and would scarcely pay any one to grow for sheep in a general way, to give them any quantity of them, or to be penned upon them (it would answer, as before observed, to have a small quantity to throw to them on the clover leys), unless the land is adapted to their growth, as they exhaust it very much.

Where cabbages are not used, I consider white turnips the best food for lambs in the months of September and October, provided they are not too old, and much preferable to Swedes, which I think too strong at this season of the year for the delicate constitution of the young lamb. The white turnips should be cut, as the expense is but trifling over the old method. Now that we have in general use Gardner's excellent machine, the work, if done by boys, would not exceed the common expense of pecking, nor be more than about one halfpenny per head per week. In the year 1834, being desirous to test the qualities of the white turnips with the Swede, I selected a lot of lambs, weighed them on the 11th of October, and put part of them in a pen, and fed them with cut white turnips in troughs: the others were penned, and had cut swedes given to them. They were weighed again on the 8th of November, and the result was found to be as follows:—

Experiment, No. 2.

Lot of lambs fed on white turnips gained in a month each on the average 10½ lbs.	Lot of lambs fed on swedes gained in a month each on the average 4¾ lbs.
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being a difference of 6 lbs. each lamb in favour of cut white turnips in the month of October. I continued the experiment for some weeks by weighing the lambs occasionally, and found, as the cold and wet weather came on, that the white turnips became less feeding. In order to prove the feeding quality of the white turnip still further, as experience has taught me not to rest upon a single experiment, whether it relates to sheep or to different kinds of management for corn-crops, since in the one case the health or constitutions of the animals may be peculiar, and as regards corn or grain, the influence of this variable climate may operate differently in some seasons upon one sort, or method of management, than another, I therefore resolved to try the white turnips against cabbage, and selected on the 1st of October, 1835, some lambs; which were weighed. One lot was put on cabbage, with a few white turnips cut in troughs daily, with clover chaff; the other lot was fed on white turnips cut and clover chaff only. They were weighed again, October 30, and the difference was found to be as under:—

Experiment, No. 3.

Lambs fed on cabbage and white turnips gained each on the aver- age in twenty-nine days 12½ lbs.	Lambs fed on white turnips gained in the same time each 11½ lbs.
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This experiment shows but little in favour of cabbage (a known good food), but it will be observed that some white turnips were given with them.

Again, in the same month of October, 1835, two lots of lambs were weighed; and one lot was penned and fed on cut white turnips and clover chaff, the other was fed on cut Swedes and clover chaff and a few white turnips. At the end of a month they were weighed again, and the result was:—

Experiment, No. 4.

Lot on white turnips and chaff only, gained each in a month 8 lbs.	Lot on swedes and white turnips and chaff, gained in the same time each 5 lbs.
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Difference in favour of using white turnips only 3 lbs. each lamb per month.

Since these experiments I have invariably used white turnips for lambs in the autumn, and find they are an excellent food, if not sown too early in the season, and preferable to Swedes during the

months of September and October, equal to them in November or until the latter part of that month, and very inferior to swedes in December, or when the weather becomes cold and frosty. Lambs are not naturally fond of white turnips, and will take to swedes much sooner; and I generally give them a few swedes first for a few days; and when my flock of lambs (viz. my ewe lambs) are intended to be penned upon white turnips without cutting, which is sometimes the case, I give them a few swedes first, upon which they continue about two days; they are then let out upon the stubbles for two or three days more, when they are again taken to the pen of swedes, which they will eat more freely; after which I put them on white turnips, and have no further trouble with them.

Experiment, No. 5.

October 7, 1840, some lambs were selected from the flock and weighed: one lot was penned on cabbage, with red carrots given them in troughs; the other lot was also penned on cabbage, with swedes given to them cut; both lots had clover chaff. They were weighed again on the 3rd of November, when those on

Cabbage and carrots gained each	|	Cabbage and swedes gained in a
in a month $9\frac{1}{2}$ lbs.		month each $10\frac{3}{4}$ lbs.

Being a difference of $1\frac{1}{4}$ lb. each lamb against the use of carrots.

Experiment, No. 6.

Again, on the 28th of November, 16 lambs were weighed: 8 put to cut swedes only, and 8 fed on red carrots and cut swedes. They were weighed again February 22, the result of which trial was, those

Lambs fed on swedes only gained	|	Lambs fed on red carrots and
each 18 lbs.		swedes gained each 16 lbs.

Both lots increased in weight but little, but the difference was against carrots.

Experiment, No. 7.

Being another trial of carrots against swedes. On October 12, 1841, some lambs were weighed: one lot was fed on cut swedes only; the other lot was fed on red carrots and cut swedes. Were weighed again November 23; those fed on

Swedes only gained in weight each	|	Red carrots and swedes gained in
lamb on an average 17 lbs.		weight each lamb 14 lb.

Against the use of carrots 3 lb. each.

Experiment, No. 8.

The Belgian or white carrot in trial against swede turnips. December 22, 12 lambs were put to keeping: 6 of them to swedes cut and clover chaff only, and 6 of them to the Belgian or white

carrots, with some swedes daily and clover chaff. At the expiration of the trial I found that those kept on

Swedes and chaff gained each on	|	White carrots and swedes and
an average 19½ lbs.		chaff gained each 15½ lbs.

Being an increase of 4 lbs. each lamb in favour of using all swedes.

Having proved, by repeated experiments, and quite to my satisfaction, the inutility of using carrots for feeding sheep, I have discontinued growing them; they are an expensive root to grow, and must injure the soil for some time afterwards if it is not well adapted for their growth.

Experiment, No. 9.

Between cabbages and swedes. In the year 1836 I drew two lots of lambs, 8 in number for each lot; they were weighed; and one lot was put upon cabbages with some clover chaff only; the other was fed with cut swedes and chaff only. After they had been kept in this manner a month, they were weighed again, and the result was found to be as follows:—

8 lambs on cabbages and clover	|	8 lambs fed with swedes and chaff
chaff gained each 11 lbs.		gained each 8¼ lbs.

The increase of weight being in favour of the cabbages 2¾ lbs. each lamb per month.

Being aware that it was the custom with some sheep-breeders to wash the food—such as turnips, carrots, and other roots—for their sheep, I was induced also to try the system; and, as I usually act cautiously in adopting any new scheme, generally bringing it down to the true standard of experience, I selected for the trial two lots of lambs—one lot was fed in the usual manner on carrots and swedes *unwashed*; the other lot was fed exactly on the same kinds of food, but the carrots and swedes were *washed* very clean every day: they were weighed before trial on the 2nd of December, 1835, and again on the 30th of December.

Experiment, No. 10.

Lambs fed with food unwashed,	|	Lambs fed with food washed clean,
gained each 7½ lbs.		gained each in same time 4¾ lbs.

Which shows that those lambs which were fed in the usual way, without having their food washed, gained the most weight in a month by 2¾ lbs. each lamb. There appears to me to be no advantage in this method of management: indeed, animals are fond of licking the earth, particularly if fresh turned up; and a little of it taken into the stomach with the food must be conducive to their health, or nature would not lead them to take it.

Much having been said and written by high authorities upon the decided advantage to be derived from folding or feeding sheep in the yard during the winter months, I was consequently induced

to try it, as my object has always been to adopt the very best system of management I was acquainted with for my sheep, and not to be bigoted to any opinion of my own unless founded upon actual experience; neither, on the other hand, do I adopt the recommendations of others upon a large scale at first. I selected, therefore, only 8 lambs for trial of this highly-recommended method of yard-feeding, which were weighed on the 7th of December, 1839, and put into a yard made in the following manner. A small plot of ground sufficient in size for 8 lambs, contiguous to my turnip-field where my other lambs were feeding, was enclosed around with hurdles, or trays set double and stuffed with straw between, not only to shelter them from the winds, but also to prevent the lambs from seeing any object that would disturb them. On the north side of the yard I had a shed built, opening towards the south and enclosed on the other three sides, for them to go under in wet and cold weather; it was kept perfectly dry, being well secured with thatch. I procured some deal boards, which were nailed to ledges about 4 or 5 inches deep to keep the boards from the ground, and sufficient space (about $\frac{3}{4}$ of an inch) left between them, so that the wet from the lambs might drain through; these were well swept clean daily, and the yard kept sufficiently littered. The lambs were fed as usual, three times a day with swedes, cut carrots, and clover-chaff. Another lot of 8 lambs, of the same breed and about the same weight, were weighed on the same day as those put in the yard—viz., on the 7th of December—and penned in the field adjoining, which was stubble-land, and were fed with the same food exactly, and by the same person as those in the yard; being exposed to the weather as sheep generally are, except having two or three stuffed hurdles to shelter them from the winds. On the 11th of February following both lots were weighed again, after being at trial 9 weeks and 3 days, the result of which was as follows.

Experiment, No. 11.

8 lambs fed in the yard gained each on the average 19½ lbs.		8 lambs in the open field gained each on the average 20½ lbs.
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This experiment proving nearly equal, I gave it up for this season; but, wishing not to be prejudiced against the practice of yard-feeding after having seen so much testimony in its favour, I tried it again the next autumn and winter, and made and enclosed a yard as nearly as possible like the one I have described, and treated the lambs just in the same manner, putting in another lot of eight lambs on the 28th of November, 1840, at the same time that they were weighed; as also penning eight more lambs, which were upon the stubble-land adjoining. Both lots had the same kind of food—swedes, carrots, and chaff; they were attended

by the same person, and managed alike, and were weighed again on the 22nd of February following, when I found the result to be as under.

Experiment, No. 12.

8 lambs in the yard gained each on the average in 12 weeks 32 lbs.		8 lambs kept in the open field gained each on the average in 12 weeks 28 lbs.
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Showing in favour of yard-feeding 4 lbs. each lamb during 12 weeks. This difference is very trifling, and not in the least sufficient to compensate any one for the extra trouble and expense which must necessarily be incurred by making yards, building sheds, taking the straw to a part of the farm where perhaps the manure is not wanted, and by the heavy carriage of the turnips, which even for a short distance, is costly.*

I think another objection arises to the plan, and that is, if the sheep fed in yards during the winter are not made fat enough for the butcher in the spring, and have to be turned again to pasture, they will suffer much more from the cold winds, having been confined and kept warm in the winter, than those sheep wintered in the usual manner in the fields. It is my opinion also, but I confess I have no means of ascertaining the fact by way of experiment, that the wool may be injured by yard-feeding; for the lambs kept in that way have a more unfavourable and unhealthy appearance than those fed in the common manner. After these trials, and finding no adequate advantage in the practice, I have given up the system of feeding sheep in yards.

The advocates of yard-feeding sheep allege that they eat less food if kept in that way than others do which are fed in the open field. During the trial of these experiments no difference was observed as to the quantity of food consumed by each lot; they ate as near alike as possible, the food being carried to them in scuttles. If one lot of sheep eat less food than another, it is a proof with me that they thrive in a less degree—of course I allude to sheep of the same size and breed—as I find by weighing my sheep monthly which are kept in small lots, that those lots which eat less food (and this is often the case without any apparent cause, as they are kept in the same way), generally gain less in weight than the other lots which feed well.

Some years ago I made many experiments between feeding sheep on grass-land in winter; viz., by dividing a close of land

* Having formerly recommended the trial of shed-feeding, I am bound to state that in an experiment like Mr. Pawlett's, I kept ten Down lambs in a shed and ten out of doors, weighing each lot regularly; but that I found the gain of weight rather on the side of the lambs fed out of doors.
—*PR. PUSEY.*

into pens of about half an acre each, into which were put about 10 lambs, and taking the turnips and other food to them; and feeding other lambs in the field, in the usual manner, where the turnips grew. It would take up too much space to enumerate them, and as the system cannot be reduced to general practice on account of the many disadvantages arising from it and from the extra expense, I see no advantage in relating them. The result of my experience is, that sheep will thrive a little faster if fed on grass-land in winter, as described, than they will if kept on the turnip-land, but the increase of weight is of inferior importance to the extra trouble and expense incurred.

It has been my custom for some years to sow a field with tares immediately after harvest for early spring feed, upon which I usually put those lamb-hogs which I wish to get the most forward in condition as early in the spring as the season will allow me. My land being adapted to the growth of tares, particularly the farm I have lately left, by sowing them early they grew a good deal before the winter set in, so that I often have had my lambs out upon the tares as early as the middle or end of February; but I always gave them swedes or carrots with the tares, as much as they would eat, and have found them go on, managed in this way, better than in any other system of management.

In the year 1833 I made an experiment of the feeding qualities of the red or broad clover against the white or Dutch clover; both sorts were well planted, and the white clover grew very strong. I drew two lots of lambs on the 15th of April, and weighed them; one lot was penned upon the red clover, and the other lot was penned upon the white clover, both pens being nearly equal in size; they were weighed again on the 14th of June following, and I found they had increased in weight as follows.

Experiment, No. 13.

Lot of lambs fed on white clover	Lot of lambs fed on red clover
gained each on the average	gained each on the average
36½ lbs.	35½ lbs.

From this it appears that there is scarcely any difference in the feeding qualities of either sort.

The custom of early shearing sheep is becoming more general than it was a few years ago, and there is a great advantage in doing so, as I am convinced the sheep thrive much faster during the summer if their wool is taken off on the 1st day of May than if it were to be left on until the first or second week in June, as the flies will not trouble them so much upon their breasts and flanks. In some districts or situations much inconvenience as loss arises from the annoyance of these insects; and I do not know of any dressing that will keep them off, except for about

two or three hours, although I have tried many of what are called preventatives. Some persons are of opinion that the wool from the sheep never weighs better than if taken off in April, as soon as they leave the turnip-field; but I cannot see how this can be proved, as no experiment, I think, can reach it. There does not appear to me to be any advantage in keeping the ewe-flock in their wool longer in the season than the beginning of May; if they are shorn yearly at this time there is still a twelvemonth's wool upon them; if the wool is left upon them until the hot weather they often lose much of it from their necks and underneath, whilst some will peel entirely.

It is not my intention to treat upon the diseases of sheep generally, neither to offer any remedies (save one or two), for this simple reason, that I know of no other specifics that I can confidently recommend; therefore I consider it much better to suppress them. It is unfortunately true that sheep are not often found to be ill until the disease has taken too deep a root to be eradicated. Various are the remedies for the very prevalent disease the foot-halt. I have tried verdigris, butyr of antimony, vitriol, and other caustics, with success; but what will effect a cure in one sheep, in a dressing or two, will not always do so in others; when that is the case, I would recommend another of the specifics described to be applied, which will, if properly attended to, remove the complaint in a few days, in most cases. Shepherds generally are afraid to probe the part affected deep enough, which ought always to be done. Whenever a sheep falls lame in a flock it should immediately be taken from the others, or more will fall, as there can be no doubt but the foot-halt is contagious. With respect to the recent epidemic, I am persuaded that it also is contagious, which I had sufficient proof of last season. My rams were perfectly healthy until June, when I took two of them to a certain agricultural show to compete for prizes. One of the competitors showed a sheep in the same class with one of mine, labouring at the time with the disease in question. With my ram it was turned out of the pen by the judges for their inspection, and both were some time together; the consequence was, that in about three days after mine got home he fell ill with the complaint; all my other sheep being quite free from it that were at pasture in the same field; indeed none of the sheep on the farm had it. In a day or two afterwards another in the same lot fell ill, and in the course of a few days about half the lot became more or less affected. About six weeks after this I had my regular show for letting rams, and had then nearly got rid of the disease, having only one sheep lame with it, for I always took one away from the others as soon as I perceived that it had got the disease. It being necessary at this time to put my sheep toge-

ther, I incautiously let the infected sheep go with the others the day after the show: the rams which had been let were put into two lots; into one of them was put the lame sheep, and in a few days several more fell ill with this much to be dreaded complaint; the other lot and those unlet continued healthy.

I have given no account of expenses incurred in the trial of these experiments: I do not see how it can be done faithfully in reference to those I have given, as many were tried years ago; indeed, I cannot see how it can be ascertained what a bushel of turnips, carrots, or cabbages can be produced at, as much will depend upon the season and nature of the soil upon which they are grown. I am confident it may happen that one season I might produce, for instance, a ton of swedes at a less price than a ton of carrots, and the next year I could produce the carrots at the least price per ton; as the season and soil might vary, and the swedes be attacked with flies, grubs, or grape, or the carrots with what is termed here the "iron-mould." With these facts in view, I have not attempted to detail the expenses, for if they are not given accurately, they had better be left out altogether.

I believe I have stated all that is required (as far as my experience has led me) in the management of sheep, and as faithfully as I can do. I might have entered more into detail, but I thought it would be tedious and unnecessary.

Beeston, Biggleswade.

XXXII.—*An Essay on the Advantages of One-Horse Carts.*—
By JESSE FRENCH.

SOME few years since, while discussing the subject of agricultural economy with my late father, I remarked to him that farmers generally incur unnecessary expense in the number of agricultural carriages they purchase; that the occupier of a farm of from fourscore to a hundred and fifty acres must have four or five manure carts, and two or three waggons, for carrying hay and corn, several of which are of no use during nine-tenths of the year, but stand about to rot; are sent to be repaired, or occupy a shed that must also be occasionally repaired; and that I thought we ought to make the same carriages carry the hay and corn that carry the dung. But at that time I was dissuaded from making the attempt; and till the year 1842 continued to carry my corn upon two waggons; and then finding one of them not worth repairing, had almost given the final order for a new one at the cost of 45*l.*, when I read in a newspaper Mr. Pusey's recommendation of the one-horse cart system as worthy of a trial. Accordingly, I proceeded to fit up

four dung-carts for carrying corn, at a very few shillings' expense, and after the following manner. Two poles, each the length of the axletree, were placed across the cart, one before and the other behind; each of these was made fast by two wooden pins passing through the pole into staples in the sides of the cart. Two other poles were placed lengthways, one over each wheel, forming lades. Next, by placing a sheep-gate with the points uppermost upon the shafts, immediately before the body of the cart, a high front was formed to keep the load from coming in contact with the horse; or rather a fore-ladder, made after the fashion of a sheep-gate, the rails extending high enough to prevent the sheaves, when thrust forward in loading, from resting on the horse's back. This was secured, leaning a little forward, by a rope or chain, with each end fixed to the fore corners of the cart. A tail-ladder of similar construction was fastened in the same way behind.

With three such carts I proceeded to carry wheat, and in four hours, with one man to pitch, picked up about 3000 sheaves, having half a mile to carry them. Whoever, then, might ridicule my novel mode of proceeding, was welcome to pick up more in the same time, and with the same number of hands, with as many waggons and horses as he pleased.

Having pursued this plan of carrying corn and hay for two years, and one of my neighbours having followed my example last year, I draw the following conclusions from the observations I have made:—That in carrying bound corn, the one-horse cart system has several advantages over that of waggons: and in carrying loose corn or hay, though the loader and he that throws it off may complain, and strong prejudices, the effect of habit, may possess the minds of all the hands employed, there is upon the whole no disadvantage. Three carts will generally be sufficient where the distance does not exceed half a mile, for one cart to be always loading; and for every additional half mile one additional cart will be about sufficient; but this will depend in a great measure upon the road.

In carrying hay, the small farmer, with his three horses and one waggon, is desirous to get it into large rows, that with a long fork he may get up a big load in a short time; and, having done so, several hands must accompany the waggon to unload: thus time is wasted by the men in passing from the field to the stack, and much labour is spent in getting it into large rows, which more than neutralizes the advantage of getting it up in big pitches. If two waggons are used, at least four or five horses are necessary to keep each waggon moving so soon as disengaged from loading or unloading; and the hands engaged in stacking often have to wait when one waggon is empty before the other arrives. If three waggons are used, all may go on with perfect regularity, but from six to

nine horses are requisite; and, provided you work single-handed, that is, with one to pitch, one to load, and one to throw off, those hands could do quite as much work with three or four one-horse carts (as the distance might require) as they would with three waggons, let them have as many horses as they may; for a man can always pitch as much hay or corn in the same time upon carts as waggons: and with this additional advantage, with his one-horse cart he has but one horse to manage, while with two or three horses the leader will be apt to turn round and trample on the corn, or get into some mischief while the man is at work, unless he have a boy to mind them, who might perhaps be employed to advantage some other way.

But, upon large farms, it is usual to work double-handed, that is, with two to pitch, two to load, two to throw off, a man to drive between the field and the stack, and a boy to set forward in the field: and before such a well-appointed band one would think that all the corn in a parish must soon disappear. But, as an example of the relative advantages of this double-hand system with three waggons, and the single-hand system with one-horse carts, I mention the following facts:—The harvest, last year, being hindered by unfavourable weather till Monday, August 19, on that day wheat-carrying generally commenced full drive, and more corn was got up in a few days than usual. On Thursday evening, mutual inquiries being made, it was found that Mr. Q——, with three waggons upon the *double-hand* system, had got up about 40 acres of wheat in the preceding four days; but that in the same four days, with four dung-carts, with one horse in each, and working upon the *single-hand* system, Mr. Y—— had got up 26 acres of wheat, and seven acres of peas. And I may add, at the same time, in something less than three days, with three one-horse carts and one man to pitch, I had got up all my wheat—16 acres, and 5 acres of clover hay.

When working upon the double-hand system, the waggon must be set, as well as may be, to accommodate both pitchers; and if the man on one side has the wind, or the higher ground, in his favour, the man on the other side must have a corresponding disadvantage; but the single man pitching upon a cart may turn it about as may be most convenient to himself, taking the benefit of the wind or the higher ground as he pleases. Hence, the large farmer, who works upon the double-hand system with waggons, might gain advantage by dividing his party into two, each party working with three carts or four, as the distance might require; or might get in a large quantity of corn with one team while the other might be at plough: and the small farmer, whether he has been accustomed to use two waggons or but one, might benefit by working his horses in carts, inasmuch as there would be no loss of

time by the men passing from the field to the stack, first to load, and then to unload, nor any waiting for the carriages loaded or empty.

There certainly are various things which a farmer may have to carry, for which one-horse carts are not adapted, as timber and hop-poles, which in Kent and Sussex are often carried a long distance. In the same district many farmers bring their hay from the marshes, a distance of from three to eight miles; for this purpose small carts are not so convenient; but for carrying hay, and particularly where it has to be carried a considerable distance, a small cart may be enlarged by this expedient. The draught staples being generally about a foot from the ends of the shafts, by attaching rings to their extreme ends for the horse to draw by, the wheels will be thrown a foot further behind the horse, consequently the fore-ladder may be fixed a foot forwarder on the shafts. This will allow for the tail-ladder to lean further back, so as the load may balance. By thus lengthening the load, and keeping it a good width, as much hay may be loaded as a horse will be well able to draw.

It is generally supposed that the nearer the wheels are to the horse the lighter will be the draught; but it is important to bear in mind, that the weight on the horse's back will be less in descending a hill, and the strain upon the belly-girth less in ascending, the further the horse is from the axletree. Hence it will be advisable, when new carts are to be constructed, to make the shaft a good length, that the horse may be placed forward or backward, according to the kind of load he may have to draw. The shafts, terminating in an iron clasp or socket with a ring at the end, will not only serve for the horse to draw by when occasion may require, but preserve them from decay when resting on the ground.

It may not be amiss to remark, that a good belly-girth buckled tight is important; that a fore-ladder and tail-ladder to fasten by chains are preferable to fixed standards, as they may be adjusted to suit the balance of the cart or the height of the horse; and that for sheaves to ride safe without a rope, a right method in loading should be observed: the sheaves being laid in rings should pitch to the centre, and nearly stand on their heads in the top.

Looking at my carts fitted up in the rude manner they are, much improvement may be made in the construction of carts to suit the general purposes of agriculture; and there are many persons who will not adopt the one-horse cart system, whatever be its advantages, till a cart of more sightly appearance is presented to their view. On the other hand, should the present low prices of produce continue, if no advantage is to be gained beyond the saving of the expense of a new waggon when one of the old ones is worn out, there are many persons who will adopt it as an acceptable alternative,

so soon as the practicability of their doing so without disadvantage is made plain to their understandings. And although ONE good four-horse waggon may, for many purposes, be very useful upon a farm, carts constructed to contain about 13 bushels, and to discharge the load by shelving, with moveable side and foreboards, to make them capable of containing about double the quantity, when rough dung, &c., are to be carried, and upon each of which, at other times, when hay or corn is to be gathered in, may be fixed a frame as wide as the wheels, or as much wider as may be thought fit, and which also may be of any useful length, provided the shafts are proportionably long, will answer all the purposes proposed so well, as to render upon a great majority of farms *several* waggons for carrying hay and corn an unnecessary incumbrance.

Rolenden, Kent, February 26, 1845.

XXXIII.—*An Essay on Gorse.* By OWEN OWEN ROBERTS, of Bangor. To which Lord KENYON's Prize was awarded.

Gorse, Whins, or Furze.—Throughout the length and breadth of the United Kingdom there are few localities in which this prickly evergreen is not to be found.

'In the northern districts of the principality of Wales, and more especially in the counties of Carnarvon, Anglesey, and Denbigh, it has, time immemorial, been in general use as food for horses.

It has also, occasionally, and when other provender was scarce, been employed as food for horned cattle. Where, either by itself or in conjunction with other provender, it has been used as food for milch-cows, the results have been highly satisfactory. It has given to the milk and butter a fine colour and a rich flavour. Those who have applied it to this purpose are of opinion that cows yield a better profit than when they are fed with the best hay, or even with turnips. The butter is in all respects of an improved quality (see *Appendix*, 1, 2, 9).

Analysis fully substantiates the correctness of this opinion (*App.* 13). The results, as to the quantity as well as to the quality of the nutritive matter contained in this plant, will bear a favourable comparison with any of those vegetable substances which are noticed in Sir H. Davy's *Agricultural Chemistry* (p. 142), and which are most highly and most universally appreciated as provender.

The experience of its utility as food for sheep has hitherto been very limited. This has chiefly arisen from the little attention bestowed by Welsh farmers upon the feeding of that class of live stock. Where, however, the experiment has been made, in

conjunction with turnips, sheep ate it freely, and improved rapidly in condition.

It is in feeding horses, however, that gorse has hitherto most generally and most advantageously been employed. It is because this plant grows so abundantly in all parts of the Principality, and because it is so much employed in the keeping of horses, that in many seasons the less wealthy classes of Welsh farmers may congratulate themselves on their escape from ruin. Without this plant, even in ordinary years, the grass-produce of many of the smaller farms, as they are at present cultivated, would barely suffice as keep for the horses employed upon them. In such seasons as that which is now passing away (March, 1845), had it not been for the extent to which gorse is used as food for horses and cattle, there were many farmers so scantily supplied with hay and straw that no inconsiderable part of their live stock must inevitably have perished (*App.* 5 and 9).

It may be safely asserted, that in the counties of Carnarvon and Anglesey, and in a portion of the county of Denbigh, four-fifths of the farmers, innkeepers, public carriers, and others who keep horses, are in the habit of using gorse as provender to a great extent, and with signal advantage (*App.* 3, 5, 6, 7, 8, 9).

Notwithstanding the indisputable advantages which the use of this plant confers upon the farmers, still the cultivation of it as a permanent crop of green succulent food for horses and other stock has been but of limited extent, in comparison with the benefits which are always to be derived from such a source.

This improvidence and this want of forethought are to be ascribed to indolence and apathy on the part of those whose interest it is to keep as large a stock as they can, and to have that stock in the best possible condition. The negligence complained of is, no doubt, partly owing to the abundance in which the gorse plant is almost everywhere to be met with, in its wild or natural state, throughout a hilly and rugged country such as Wales. The commonness of the plant, notwithstanding its intrinsic and acknowledged value, has had the effect of leading not a few to neglect the cultivation of it. Some have thought it undeserving of their notice, and others beneath their dignity; for there are those who are silly enough to imagine that nothing can be good but what is fetched from a distance, and purchased at a high price.

The cultivation and the nursing, however, of this evergreen, common though it be, are deserving of the greatest attention. It presents to all classes of farmers advantages which it is difficult to enumerate. It will grow luxuriantly on the thinnest, the coldest, and apparently the most sterile soils. It is capable of being used, as circumstances may require, at one year's growth,

as well as at two. With moderate attention to its culture, and by keeping it from being injured by sheep and cattle, it will produce, if it be cut every year, at the rate of from 8 to 14 tons per acre, of good succulent provender; if it be cut every second year, it will yield at the rate of from 12 to 24 tons per acre.

It is difficult to estimate the benefits which a few acres, in proportion to the size of the farm, under this crop, and where the land is thinnest and poorest, would confer upon the farmer. Taking into consideration the relative value of land required, and the difference in the expense of tillage, the gorse crop might be as important an item in the farmer's balance-sheet as a crop of turnips.

It is not however intended, by challenging this comparison, to inculcate a notion that the nursing of gorse should supersede the culture of turnips and of other green crops. Quite the contrary. The object is to show that an immense *extra* quantity of green succulent provender, as a cheap and valuable substitute for hay, may be always secured—and that independently of dry seasons—at what is really a trifling expense, and from lands that, as to their present produce, are absolutely of no value. This fact is very clearly exemplified in localities in which some attention has been paid to the cultivation of gorse.

Instances have occurred of farmers having been known to pay at the rate of 15*l.*, 20*l.*, 30*l.*, aye, 40*l.* per acre for gorse, to those who had bestowed some little care in the cultivation of it, and that upon land immediately contiguous to that which they themselves occupied (*App.* 4). Scores of acres of the land so held, though capable, with the slightest attention, of yielding luxuriant crops of gorse, are suffered to be of no value. Nay, such farmers allow whole districts to remain unproductive. Their own grass crops, from want of activity and forethought, are almost worthless; and they purchase in the immediate neighbourhood, at a high rate, of more intelligent and industrious individuals, that very provender in the form of gorse which land in their own hands, if judiciously managed, is capable of furnishing in abundance, and in return for the most trifling outlay.

The correctness of this observation will not be questioned by a single unbiassed agriculturist who is familiar with the counties of Carnarvon, Anglesey, and Denbigh. No practical man, who takes an interest in agricultural concerns, can pass through these counties without being struck in some localities with the extraordinary luxuriance which the gorse crops present on banks and cuttings adjoining to public roads, and upon ditch-banks, fence-mounds, declivities, and steep side-lands, as well as in all other places where that plant had been sown, and where it had been assiduously nursed and protected.

The cultivation of this plant upon the thinner and the poorer soils will enable the farmer, supposing him to be so inclined, to improve those parts of his farm in which the soil is of a deeper and a better quality, and to raise heavy crops upon them. The green provender which the cultivated gorse would secure to him, from localities that would otherwise have yielded him scarcely anything, would allow him more time and freer scope to bring the rest of his land into profitable tilth.

Perhaps nothing had a more direct tendency to check the advance of good husbandry than the failures which farmers so frequently, nay, indeed which they generally experience, when attempting to cultivate the artificial grasses. In nine cases out of ten these failures may be traced to two causes: one of these causes is, that in the tillage sufficient care is not taken to clear the land of the roots of couch-grass and other indigenous weeds. When these roots are left in the ground the application of manure stimulates them into such luxuriance as to overpower, and ultimately to destroy, all the artificial grasses. These grasses are always more delicate feeders than the couch and other perennial indigenous grasses. The other cause of the failures which farmers so often experience with the artificial grasses, after having bestowed the greatest care on cleaning the land, is in a great measure attributable to the seeds of couch-grass and of other perennial weeds, which are conveyed to the land in the dung used to manure it. The vegetative powers of such seeds is not at all impaired by their passing through the stomach and bowels of the animals fed with the grasses that produced them. The farmer, every time he manures his land, conveys into it in the dung a full supply of the seed of the very weeds, upon the removal of which, as roots, he had bestowed so much trouble and expense.

Independently, therefore, of the extra quantity of provender which such land would produce under gorse, the absence of the seed of couch grass, &c., from the dung of the stock fed with gorse, is a matter of importance to the farmer; and deserves the consideration of every agriculturist who intends to bring his land into proper tillage, and to manage it with advantage.

By thoroughly clearing off land the roots of weeds, and by keeping it free from their seed, the cereal and artificial grasses have all the benefit of whatever manures may be intended for them. To carry good manure into foul and dirty land, or foul manure into that which has been well cleaned, is to expend capital and labour in encouraging weeds to vegetate with luxuriance, and endlessly to perpetuate their species.

In stating that gorse will grow luxuriantly upon the thinnest, the coldest, and apparently the most sterile soils, it is not meant to convey the idea that it will not grow more luxuriantly, and

produce much heavier crops, in some aspects and upon some soils than others. It delights in a warm aspect. In those parts of Anglesey and Carnarvonshire, where the country is bleak, and the fences are constructed with sods and earth, the gorse sown or planted on the southern side of the fences presents a far more generous appearance than that on the northern side.

The natural and most deadly enemy to gorse, and, indeed, to every crop that the agriculturist has to cultivate, is couch-grass. If the land be ever so poor, provided it be tolerably dry, and free from couch grass, it will always produce, under proper management, a good crop of gorse.

On both sides of the vale of Conway, patches of fine healthy-looking gorse are to be met with on almost every farm, the soil being generally what is called sharp barley land. Throughout Anglesey, on the most bleak spots, and on every variety of soil, the gorse plant is to be seen in luxuriance. The same may be said of many parts of Flintshire and Merionethshire as to the general prevalence and the flourishing appearance of the plant. It is an undoubted fact, that in Wirrall and in other parts of Cheshire the cultivation of the gorse plant by farmers, as provender, would be attended with most profitable results. There are hundreds, if not thousands, of acres, in the counties of Chester and Salop, now, comparatively speaking, worthless, which might, with a trifling outlay, be made to produce to the farmer heavy and valuable crops of gorse.

The earth carried from excavations and cuttings connected with the numerous railways in progress throughout every part of the kingdom, and the slopes on the sides of those railways, may be regarded as furnishing the means of introducing, and of extending, the cultivation of the gorse plant as provender, at an expense that would barely amount to more than double the cost of the seed (*App. 6*).

The chief point in the raising of gorse is to clear the land from couch-grass, and to make it tolerably dry. To attain the former object, the best plan, if the soil be tolerably deep, will be to carry off a spit deep of the surface. The value of the soil in forming a compost with lime, sand, clay, &c., will amply repay the expense. After repeated failures, by removing the active soil which abounded with roots, and exposing the yellow rammel, comprising the sub-soil, farmers have succeeded in producing heavy crops of gorse. Mr. Hugh Roberts, of Rhosmeulan, adopted this plan, and sold the first cutting at the rate of 30*l.* an acre. Where soil is thin and the surface is foul and loaded with couch-roots, it should be pared with a breast plough and burnt. Where the land is composed of cold, stiff, retentive clay, the best expedient will be, should the surface be loaded with couch-grass roots, &c., to take

off a thin paring, and to burn it. The land afterwards, in order to preserve the plants from the bad effects of water, should be put into ridges, similar to those prepared for the reception of turnip-seed.

The sort of gorse cultivated for provender is known by the name of French gorse (*Eithin Ffrengig*). The best time to sow the seed is in March or April. If sown broadcast, about 5 or 6 lbs., or if drilled, 2 or 3 lbs. per acre will be the quantity of seed required. When the plant is to be in rows, and where the ground is very steep, as on the sides of hills, road-cuttings, the sides of embankments, &c., the direction of the rows should be oblique, and not directly up and down. The distance between the rows should be from 15 to 18 inches.

Where the plant is to be raised on level ground, 18 or 24 inches should, at the least, be allowed between the rows, so as to afford to the plants the full benefit of the sun and the air. Light, and the warmth of the sun's rays, and the free circulation of air, are all indispensably requisite to promote luxuriant vegetation.

The seedling plants of gorse are far more delicate and susceptible of injury than they are generally considered to be. It is, therefore, of the utmost importance that they should not be smothered with couch-grass and other weeds, and that they should be carefully protected from sheep and cattle. Inattention to these points will generally render the cultivation of gorse a failure.

To reclaim old gorse covers, such as are to be met with in Cheshire and in Shropshire, and in most fox-hunting counties, and to make them a source of profit to the farmer, the plan is, during the winter, or early in spring, to cut the woody plant as close to the ground as possible; afterwards, with mattocks, to stir up the soil in the spaces between the stumps, and to divide the roots of the plant freely. After this has been done, an abundance of young shoots will be thrown out, which will afford a rich supply of provender, to be available either at one year's growth or two, as the demand for it may require.

Seedling gorse should not be cut for use until it is two years old; but after the first cutting, it may be cut every year, should there be need of it. It will, however, generally be found to produce a heavier crop and yield a more profitable return, in some localities, by allowing two years instead of one to intervene between each cutting (*Appendix 10*).

When the plant is raised in rows, it will always be found advantageous, after the first cutting, to take for use, every year, alternate rows. By adopting this method, there will be secured a constant succession of two-year old gorse. This plan will also secure to the lower branches of the plant a free exposure to the influences of light and air, and so prevent a great portion from becoming

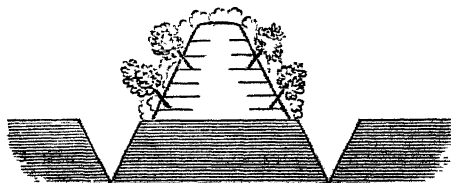
brown, dry, and withered, as two-year old gorse will when the crop is thick and close upon the ground.

Various kinds of dressings have, from time to time, been suggested as proper and necessary for the sustentation of the plant. Sand, lime, coal-ashes, cinders, &c., have each of them had their strenuous advocates and partisans. Experience has fully proved, that heavy crops may be had from the same land, for any number of years in succession, without any manure whatever. But for this purpose the land must be kept sufficiently free from water, care must be taken that the seedlings are not smothered by couch-grass before the plants have become strong and vigorous, and the young shoots must not be exposed to the browsing of cattle or sheep.

The injury done to gorse by cattle, sheep, horses, and asses, is not confined to the mere browsing. By nibbling and jaggng the young shoots, they check the growth of the plant; and this, conjointly with the tracks which they form in walking about, gives to the couch-grass the advantages of a start, which it could not have had if the growth of the gorse-shoots had not been checked, and if no tracks had been made.

In many parts of the country gorse is cultivated on the sides of turf fences, and at the foot of stone walls, as well with a view to protect and to strengthen the fences as for the feeding of cattle.

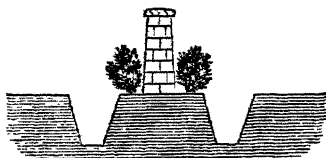
In some places the enclosures are made and the land is divided by fences made partly of stones, and partly of sods, the middle of the fence being filled up with earth. In other places the sides of the fences are entirely composed of turfs or sods, and the middle is filled with earth. In both cases, the turfs or sods, and the earth to fill up, are taken out of a ditch made for the purpose on both sides of the fence. A section of one of these fences would present something like the following appearance:—



When these mounds or fences have been made, the gorse-seed is sown in drills, lengthways, on their tops, generally in two rows; and on both their sides in two drills, made with the corner of a spade or with some other suitable instrument; one a few inches from the ground, and the other about midway between that and the top.

The crops produced by pursuing this course are almost always heavy and luxuriant.

If the fences of the enclosures are made with stone, the cultivation of the gorse on each side of the walling, where the situation is raw, bleak, and exposed, and the land is cold and poor, will prove serviceable in other respects besides being a source of profit. The ditches on either side of the wall, and the gorse growing between the inner edge of the ditch and the foundation, will protect the wall against being injured by cattle.



This latter mode of raising gorse as food for numerous teams, and also as a safeguard to stone fences, has been adopted for many years with eminent advantage by Mr. Hughes of Madyn, in the neighbourhood of Amlwch, in the county of Anglesey.

The former method is very common throughout the counties of Carnarvon and Anglesey.

On a small property in the county of Anglesey the owner, Mr. Williams, of Fron goch, constructs his fences by forming an inclined plane of earth up to the top of the walls.



A row of quicks is planted close to the top of the wall, and even with it. The rest of the elevated earth is sown with gorse, and the plant thrives to admiration.

To cut gorse some persons have recommended the use of a strong short scythe. This instrument answers very well where the land is even, and when the gorse is to be cut at one year's growth.

The most effective implements, however, are a hook in the shape of a reaping-hook, but stronger, and a stick about 2 feet long, and of the thickness of a common walking-stick with a fork at the end.



With these simple tools a man will cut with ease, according to the nature of the ground and the state of the crop, from one to two cart-loads in a day.

The expense of cutting and gathering the gorse will, of course, depend upon the state of the crop and the nature of the ground. Any one who takes these circumstances into account will be able to form his calculation without difficulty. If it be an average crop, a man may cut in 3 hours enough to serve seven horses for a week (6, 5, *App.*). In 4 hours a man ought to cut a cart-load of gorse, containing 10 bundles; each bundle when mixed with chaff being amply sufficient to supply two horses with food for 24 hours.

The modes of preparing the gorse-plant for provender have been various. In former periods the gorse mill and the chopping block were the two contrivances by means of which this operation was always performed. Of late years these instruments have, in most localities, been superseded by machines such as are now used for cutting hay and straw into chaff.

A gorse-mill for crushing, or blocks and mallets for chopping and bruising gorse were, forty years ago, appendages to almost every farm-house in the counties of Carnarvon and Anglesey, as well as in a great part of the county of Denbigh.

In the construction of a gorse-mill three or four rows of strong angular pieces of wrought iron are firmly fixed in the shaft of a water-wheel. The length of each row, as well as of the teeth, is regulated by the power of the wheel. The rows are generally from $2\frac{1}{2}$ feet to 3 in length. The teeth in the rows are about 6 inches long, clear of the shaft, that is, exclusively of the shank, which is driven into the wood constituting the shaft. The shaft so armed is placed to turn in the inside of a strong wooden box, having three wooden beams, each with a row of iron teeth, fastened within it, similar to those with which the shaft is armed (see *Appendix*).

The gorse is thrown in at the top, and when the wheel is in motion the teeth on the shaft in passing between those which are on the beams inside the box effectually crush the gorse. As soon as the gorse is deemed to have been sufficiently crushed it is taken out from the opening at the bottom by the person who attends to the mill (see *App.*). A mill upon this principle crushes the gorse, including most part of its woody fibre, into a kind of pulp suitable for horned cattle and for sheep as well as for horses.

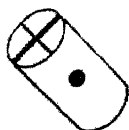
Gorse thus prepared should be used as soon as possible after it is taken from the mill, for if it be kept more than a few hours it will ferment, heat, become sour, and be unfit for provender.

The chopping-block and mallets, once so generally employed, are very simple, though efficient contrivances. In the absence of better they answer the purpose remarkably well.

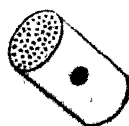
The block is formed of the but or root part of a large tree.

This is set up in a perpendicular position. A strong wooden hoop is firmly fixed as a rim around two-thirds of the circumference of its top above the surface of the block, to prevent the gorse as it is chopped from falling off. The part not protected by the hoop is left open in order to facilitate the removal of the gorse when it has been rendered fit for use.

The mallets are composed of round pieces of wood about 8 or 9 inches long and about $4\frac{1}{2}$ inches in diameter. They have wooden handles of suitable lengths to work them with. One end of these mallets is secured by an iron hoop and armed with two strong knives intersecting each other. These knives are firmly fixed in the mallet with a shank, and the knife or cutting part rises about 3 inches above the wood.



The gorse when it is intended for cows is again, after being chopped with these knives, put on the block and bruised with another heavy mallet, which has its ends thickly studded with nails such as are employed to secure the tires of cart-wheels. This renders the surface of the mallet knobbed and uneven, and well calculated by bruising the chopped gorse entirely to destroy its prickly quality.



The method, as before observed, now in general use for preparing the gorse and rendering it fit to be given as provender is by means of an engine or machine well known to all who are in the habit of reducing hay and straw into chaff.

If this machine be worked by manual labour, two men and a boy will, in twenty minutes, grind a sufficient quantity to keep four horses for 24 hours (*App.* 5). If it be worked by a single horse, one man in $1\frac{1}{2}$ hour, or at furthest in 2 hours, will prepare a sufficient quantity to keep 10 horses for 24 hours (*App.* 7).

Of course, when these engines are worked by a water power, a great saving is effected.

An ingenious Anglesey blacksmith has constructed a small steam power, the cost of which is under 20*l.* It requires only 4 bushels a day of Berw coal-slack to work it. The cost, therefore, of the fuel consumed does not exceed 9*d.* a day. One of these engines, the property of Mr. John Williams, of Fron goch, is now undergoing an alteration in its arrangements, at an expense of from 8*l.* to 10*l.* Hereafter it is to work a threshing-mill, as well as a gorse and straw-cutting machine, a churn, &c.

Before engines came into general use the price paid for chopping gorse was 2*d.* a quarter, or one farthing a bushel (*App.* 6).

A bushel of gorse when prepared with a cutting-machine

weighs, according to the quality and the state it is in, from 12 to 15 pounds. When chopped or when prepared by the old-fashioned mill it will be something beyond that weight.

In feeding stock gorse should always be considered as an important and a highly economical substitute for hay. The quantity required, if used alone, to keep a farm-horse of moderate size is about 40 lbs. every 24 hours. The quantity is, of course, to be diminished in the proportion in which other kinds of provender are used conjointly with it.

Two parts of gorse with one of cut hay and one of cut straw will keep horses in far better condition than hay alone. With a moderate addition of corn and a proportionate diminution of the hay and straw a horse will be fit for any work to which a farmer or a common carrier may wish to put him.

A moderate portion of gorse substituted for hay with a full allowance of corn is a highly beneficial modification of provender for coach-horses and poststers.

It must be borne in mind that it is what is called a very heating food, and, therefore, horses largely fed on it should have occasionally a little sulphur and nitre, with a bran-mash, given to them; or a portion of their food should consist of potatoes, Swedish turnips, carrots, or parsnips.

Mr. Ed. Jones, of Ffriddoedd, a farmer in the parish of Bangor, is in the habit of preparing food for two teams of horses and a galloway, by pouring every night over the gorse and chaff on which he feeds them, about half a bushel of boiled swedish turnips, as well as the water in which they have been boiled. The horses thus kept are sleek-coated, in high condition, and fully up to their work.

The use of gorse as food for cattle has not been so general as it has been for horses. In numerous well-authenticated cases the use of the gorse plant for that purpose has been marked with the most advantageous results, even when that has been the only food supplied to them. They eat it freely. In general it is given to milch cows in conjunction with other provender.

Cottagers who keep one cow, and a large class of small farmers who keep two or three, feed them with a mixed kind of food, composed, in addition to gorse, of mashes, ground oat-shellings, the chaff of different kinds of grain, potato-parings, together with a little hay. Cows thus fed, especially if the gorse be of good quality, will yield a profit that would excite the astonishment of the proprietor of many a large dairy.

The quantity that a horned beast will consume will be, as to weight, if the quality be good, much upon a par with what it would consume of hay and straw.

Turnip-fed milch cows are wont to have their milk and butter

tainted with an unpalatable flavour. The substitution of a portion of gorse for their food will effectually prevent this result.

Mr. H. Bicknell, of the Penrhyn Arms, Bangor, the owner of an extensive dairy, kept his milch cows one winter exclusively upon gorse. His dairy, as to the quantity, became less productive; but the quality both of the milk and butter was greatly improved. The milk was rich, and the butter excellent in colour and flavour. Before the month of May, however, he found that every one of his cows had lost all the hair off its skin. This is to be attributed to the cows not having had any allowance of cooling food, such as turnips, potatoes, or bran-mashes; as well as to the dry shrivelled state of the gorse during part of the time that the cows were fed with it. The store and barren cattle that were out and had it given to them on the field did remarkably well.

Mr. Bicknell keeps a great number of horses for coaching and posting, as well as for farm purposes; and has for many years been in the habit of using gorse, in some instances partially, and in others wholly, as a substitute for hay.

It is the great difference in the cost of production, as well as in the amount produced per acre, that gives to a gorse crop so decided and so overwhelming an advantage as to profit over a crop of hay. A single cutting of gorse was last winter worth 16*l.* an acre, and many acres were sold at that rate. The gorse grew on land not otherwise worth, at the highest estimate, more than 7*s.* or 8*s.* the acre.

The cultivation of this plant even in Wales, where its use has been known time immemorial, is as yet in its infancy.

It is to be hoped, however, that so rich a source of profit will no longer be overlooked by the occupiers of land in similar districts. If they will but avail themselves of the benefit which the cultivation of this common plant presents to them, they may keep a larger stock than they have at present, and that in good condition, may save tanks of urine from their sheds, increase the size of their dung-heaps, and so raise heavier crops of potatoes and turnips.

APPENDIX.

No. 1.

Thomas Williams, of Penhewar, in the parish of Bangor.

I AM 74 years of age. As a farmer and a cowleech, I have been practically acquainted with the use of gorse as food for cattle since I was a boy. When milch cows are fed with gorse the produce in milk and butter is always better than when they are kept on hay. My father

died about 63 years ago, and my mother was left in the occupation of a small farm called Cilmelyn, in the parish of Bangor, with myself, then 11 years old, and two younger brothers. The rent of that place, though now 12*l.* 12*s.*, was only 1*l.* 5*s.*

There was no winter fodder whatever for the three cows that my mother had, and hay was at that time sold at 2*s.* 6*d.* the cwt. My mother set me and my two younger brothers to gather and to chop gorse, promising to each of us a new pair of shoes on May-day if we did our work well. We gathered the gorse on the borders of a common; and with two mallets and an axe, which I fancy I see before me now, we chopped and bruised what was required to keep the three cows up to May-day. We received the promised new shoes; and the cows, when turned out to grass, were in a far better condition than when they used to be fed with hay. My mother always afterwards used to say that her cows never yielded such good profit as they did the winter they were fed with gorse by her boys.

No. 2.

William Owen, of Nantporth, in the parish of Bangor.

I HAVE used gorse, when I could get it, during the last twenty-eight or thirty years as food for milch cows. It is the best food that can be given to them. I invariably found, after all the gorse had been consumed and the cows put upon other food, that the quantity of milk and butter would greatly diminish. Gorse decidedly beats both turnips and swedes; it produces richer milk and better flavoured butter. Whenever I can get gorse, I prefer it to any other winter food for my cows; when it is scarce, for the purpose of making it go further, I mix or give at the same time with it according to circumstances, chaff, turnips, swedes, cut-straw, and hay. I prepare the gorse, after being chopped or ground, by bruising it with a wooden mallet on a large flat stone.

No. 3.

AT Cefn y Coed, in the county of Denbigh, in the late Mr. Roberts's* time and afterwards, gorse was used in conjunction with hay, and now and then a few potatoes as winter provender for the cart-horses as well as for the saddle-horses. A gorse and malt mill, worked by water, had been an appendage to the property time immemorial. Mr. Roberts's horses were always in excellent condition. The gorse was luxuriant, and was generally cut at two years old.

The side-land on which it grew had no manure placed on it within the recollection of any one acquainted with the locality. There are in the same district many similar instances. That part of the country which is hilly abounds with thickly wooded and deep glens; sheep are not so generally kept as they are in those that are more level and less wooded. * Mr. Roberts, however, had a small lot of South-downs, and, what was rather rare in those days, forty or fifty years ago, he used to grow a few acres of turnips and cabbages for the use of his stock. One

* The father of the Author of this Essay.

very hard winter he fed sheep with gorse in conjunction with some sliced turnips. They ate it freely and fattened rapidly.

No. 4.

This occurred in the parishes of Llanwndaf and Llandwiog. A single cutting of two-year old gorse on the banks of the Nantlle Railway has been sold at the rate of 20*l.* and even 30*l.* an acre. Mr. Hugh Roberts, of Rhosmeulan, sold some at the same rate; and the late Captain Jones, of Dinas, near Carnarvon, sold a crop at the enormous rate of 40*l.* per acre.

No. 5.

From Mr. Edwards, a Farmer and an extensive Land Valuer.

Fronerch, April 18th, 1845.

A good two-year old crop of gorse is worth 9*l.* or 10*l.* with us in this country. I myself have paid for the last two years at the rate of 8*l.* per acre, and from which I got 36 two-horse cart-loads; and I considered I had a bargain. This gorse grew on land which I had valued at 9*s.* per acre; and it was and is so let now. The tenant considered he was doing me a favour by letting me have the gorse so low. I was last autumn travelling with Mr. Aneurun Owen, and passing extensive patches of gorse growing on side-land (sandy), worth 1*s.* per acre. He asked me what such a crop of gorse was worth with us; and I told him what I paid; but those that we were then seeing were inferior to what I bought. He said that he had bought an acre in his neighbourhood just such as those we were looking at, and for which he paid 7*l.* Horses thrive better when they get gorse and hay than on hay alone. Our men are always grumbling and in bad temper if they have not plenty of gorse to feed their horses. They will ask you, when you hire them, if you have plenty of gorse for your horses; and they will tell you that they would sooner take charge of a team of horses to feed with gorse *alone* than with hay alone. In point of cheapness, *I should say that the cost of feeding with gorse is not more than one-third of what it is with hay.* I have never given them to cows; but this winter they have been given very extensively even by large farmers. Mr. John Hughes, of Tyddyn Cae, a large farmer, was telling me last week that his cattle did remarkably well on them, and that they did not leave any behind in their mangers. Mr. Hughes prepared the gorse with a common cutting-machine for his cattle, the same as for his horses; some of his cattle had a few swedish turnips with the gorse, but many were fed on gorse with a little hay, without any turnips. The fact is, that if it had not been for gorse, one half of the live stock in this part of the country would have been starved the last winter. Small farmers in Llanengan *generally* feed their cows with gorse and straw, as most of them *have* but little hay, and many none.

A man will cut a load of gorse in four hours, such load to contain ten bundles. A bundle is what we call *Baich Gur*. Two men and a boy will grind in a gorse-mill a bundle in twenty minutes. A bundle so

ground, mixed with chaff, is sufficient food for two horses for twenty-four hours, with a very little hay put in their rack at night.

No. 6.

From Mr. T. Williams, Occupier of a large Farm and a Breeder of Stock in Anglesey.

Llanfawr, 21st April, 1845.

In the spring of 1843, I prepared a field of 4 acres for gorse; 2 I planted in February with plants from small beds sowed in July, 1842, in a corner of the field; the remainder was sowed broadcast (as clover) with barley very thinly sowed. 4 lbs. of seed I put in the beds; 20 lbs. sowed broadcast in the other part: it took four men six days to transplant. This season I sold about 3 acres of this field to different parties for 24*l.*; it would not fetch more than 16*l.* another year, fodder being this season very high; 50*s.* worth of what I sold would keep a horse for six months. From 1st of November to the end of May, last year, about 2 acres of gorse kept my 7 horses; this year it took about 3 acres, the crop being lighter. I always cut at two years old. I give them besides a little swedish turnips in winter; about half a bushel of potatoes daily in spring, between the seven, and 4 bushels of oats weekly. I think I can challenge any farmer in the county for the good condition of my horses. About 8 kibbins (48 lbs.) will serve a horse for twenty-four hours. Some horses eat more than others; all eat more in winter than in spring; lean horses eat more than fat ones. I never prepared any gorse but for horses, owing to the want of a proper machine to prepare it fine enough for cattle. A man may cut in the field in three hours enough for seven horses for a week; they used to pay 2*d.* per quarter for chopping before cutters were used. I consider the saving 60 per cent. to a farmer in feeding horses with gorse instead of hay.

As for gorse for cattle, about 30*s.* worth served each cow from my field this season; and they are in much better condition than those fed with hay—the gorse was chopped; the butter and milk is better, but it is great labour to prepare it fine enough.

No. 7.

From Mr. J. Atkinson.

Mona House, 20th April, 1845.

In reply to your note respecting gorse as food for horses, I beg leave to inform you that never have its beneficial properties as fodder been more clearly proved than in this year of scarcity. We have had ten working horses kept entirely upon it from the 10th of November to the 1st of March, without a grain of oats or one blade of hay; and the average consumption being, as near as I could calculate, from a number of trials, from 38 lbs. to 42 lbs. of gorse per horse, *per diem*. The food was always portioned out to them by measure; and the difference in the weights will arise from the greater or lesser quantity of succulent matter

contained in the gorse of different localities on the farm. During the whole of this period their work was exceedingly heavy; principally employed in ploughing for eight hours each day; notwithstanding which, they kept in as good condition as is requisite for a farm horse; and in fact in much better condition than what I have seen horses kept upon much more expensive provender. From the 10th of March to the present time (in consequence of a deficiency of this valuable plant) we have been obliged to curtail the allowance of each horse one-third, and to give in its stead 5 lbs. of oats mixed up with about the same weight of cut straw each day.

One man only was employed to cut the gorse, and another was engaged part of each day in fetching it from the collector, and cutting it with the engine. The person employed to collect the gorse was a very old man, and past hard labour, therefore, of course, he would take double the time to collect a given quantity that a younger and stronger man would.

The quantity consumed by the ten horses was generally converted into food, stripping of stalks and everything included, in about the space of one hour and a half, or at the furthest two hours. Our engine is driven by one horse, and requires no driver or any other attendant besides the man who feeds the engine. The diameter of the gin-race or horse course is eighteen feet, and the number of cuts the engine makes, for one revolution of the horse, is 104. It therefore follows, that in the space of one hour, the horse walking $2\frac{1}{2}$ miles in that time, the engine will have made 12,662 revolutions; and, during each revolution (having four knives), will have made four cuts, each cut exhibiting a sectional area of $22\frac{1}{2}$ square inches. The length of the cut I cannot give you, as that depends upon the way the engine is set to work; many of the newest construction cutting it at two or three different lengths.

There is hardly a farmer in Anglesey but will (this year especially) speak loudly in praise of gorse; but, as you are well aware, its culture is exceedingly neglected. Very few persons in the island have ever directed their attention to the proper cultivation of it, but have been content to derive their supplies from the spontaneous production of the rocks and other waste places, and what little they may have sown upon the tops of their fences.

I am clearly of opinion that, as food for working horses, it is the most valuable substitute we have for that expensive article hay, and with a little modification in the preparation of it to suit the natures of cattle and sheep, may with equal success be used as the chief article of provender for them also.

No. 8.

From Mr. Edwards, the occupier of a large Farm and an extensive Coach and Horse Proprietor in Carnarvon.

Uzbridge Arms Hotel, 22nd April, 1845.

THE result of my experience of gorse as food for horses is, that I have fed fifty horses upon it, mixed with hay and straw, for the greater part

of the last winter, and have found them look quite as well, if not better, than when fed upon hay alone.

I use it with hay and straw, mixed in proportions of half gorse, the remainder hay and straw, and find the saving in expense to be at least one-half. My mode of preparing it is by cutting it with an engine, and mixing it as it is cut. I remember a large number of horses fed at an establishment that I am acquainted with, for a great portion of the year, and though they did fast work as some of mine do, I think I never remember them looking better, nor indeed doing their work better, if so well.

I am of opinion that if the value of gorse was better known, it would become almost universally used as food for horses and cattle.

No. 9.

From Mr. W. Elias, the occupier of an extensive farm, a land-valuer, and agent to the Right Honourable Lord Newborough.

THE old gorse-mill at the Abbey was worn out a few years, and got me into the hobble of setting another up in the midst of the outbuildings that were erected here a few years ago. The water-wheel now drives a pair of stones for grinding corn, a churn, and a straw cutter, in the stable loft, and a set of teeth for crushing the gorse, doing all very satisfactorily. But I at some times question whether I had not better have had the knives instead of the teeth, as I see very many who had an old teeth-gorse mill, throwing it aside and adopting the common engine, which cuts the stalks and all clean through, dispensing with the *crushing* part of the preparation. In favour of this, nevertheless, I still have my predilections: I cannot fancy the *short cuts* of the stalks as either palatable or digestible for beasts, to say nothing of the prickles left entire by the knives. The old teeth render the prickles harmless, while most of the wood stalks are drawn through the teeth, or broken so large that we generally find them in the manger after what is eatable has disappeared.

With respect to the utility of gorse for horses, it is so well known and universally admitted as a cheap and useful food, that it is needless to say anything to a *Cymro* about it. At this moment many thousands of animals—horn and hoof—*would*, if they *could*, testify that gorse had saved their lives to hear the present cuckoo. Where has it not been used from the Ffrengig to the squattest* *Marlais*? If I had a field of fine *Eithin ffrengig* free from the nuisance of having a layer of fallen dead oak leaves—which it is my sad misfortune to have, and very often in this country it is so with others, I do not think I should have so valuable a field on my farm. But I think hard-working horses may have too much of gorse alone, and that it should be mixed with cut straw, barley-chaff soaked, &c. Indeed towards spring I think a few potatoes very necessary with it. For idle running colts it is a capital feed. For cows, with wheat, barley, or oat-chaff and turnips, or potatoes if you

* The Ffrengig is the French gorse in common use. The *Marlais* or *Morlas* is a dwarfish sort of a browner colour, less succulent and not in demand unless when provender is extremely scarce.—O. O. R.

please, I would always secure to myself a beautiful and plentiful supply of yellow and sweet milk, and butter, just as in summer. From the kind of ground it grows on, and the never-failing nature of the crop, I always think it is an invaluable article, in seasons like this, and in a country where the other crops are liable to failures, as has been the case with hay and corn, in a great part of these upper lands, during the late seasons.

A boy with my gorse-mill will have crushed a supper for a dozen horses in about an hour. By this, I imagine, I must have tired you with a long reading of what you know better than I do; but it is all the answer that I can make to your note.

No. 10.

From Mr. Owen Jones, an experienced land agent, and the owner of the Gorse on the banks of the Nantlle Railway.

Carnarvon, 19th April, 1845.

I HAVE cut the gorse on the *made* banks every year for five years running, and as they fall off I allow them to run into two years. On the slopes, where there is a hard natural subsoil, or inclined to *wet*, I cut them generally at two years old; but I beg to observe, that this I do for my own interest, as the two years old will sell for generally *more* than double they would at one year, and those on the hard subsoil would die by being cut every year. It is my opinion that the purchasers are quite mistaken, as there is more food in a square yard of one year old than in a square yard of the under decayed, long-shank, two years old. By my annual cutting, and the grass smothering them, they get into patches, which I get pricked and re-sowed about every three years.

No. 11.

From Mr. Johnston, a large farmer, and an extensive coach and post-horse keeper.

Victoria Hotel, Llanberis, 23rd April, 1845.

IN answer to your inquiries, I beg to inform you that, in the year 1842, I sowed nearly two acres of land on my farm at Cefn-tre-seiont, near Carnarvon, with gorse, employing 52 lbs. of seed. The plants were luxuriant, and the gorse was cut this last winter. I used it a third of gorse, a third of hay, and a third of straw, as fodder for nine horses, and my horses never were in such excellent condition.

I consider gorse invaluable. I wish I had ten acres of it instead of two. I would much rather have ten acres of gorse than ten acres of the best wheat that I ever saw in my life.

No. 12.

A FARMER in the county of Carnarvon has of late years adopted this plan of forming fences, and has cultivated gorse upon them. His is a well-stocked upland farm of about 200 acres. By having paid some attention to the cultivation of gorse, he has been enabled this year to keep his stock in good condition, notwithstanding the scarcity of provender, and to sell upwards of 60*l.* worth of hay, instead of buying, as was the case with many farmers in the district.

*Analysis of Gorse by Mr. D. Waldie, of Liverpool.**Apothecaries' Hall, 23rd April, 1845.*

Chlorophylle or green colouring matter	2·8
Saccharine matter and extract of a slightly bitter taste	15·7
Gum and mucilage	5·1
Glutinous extract, nearly tasteless, by boiling water	5·5
Vegetable albumen	1·1
Lignin, or woody fibre	51·1
Water	16·2
Loss	2·5

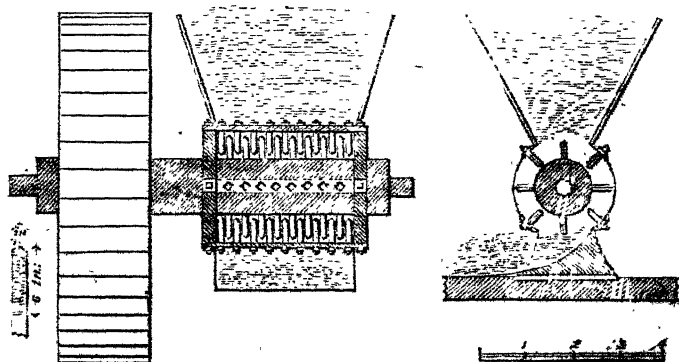
100·

*Amount of Ash left by burning 21·8 in 1000 parts.**Analysis of the Ash.*

		Proportions, deducting the three last constituents.
Potash	26·70	34·4
Soda	·22	·3
Lime	23·37	29·9
Magnesia	4·31	5·5
Sulphuric acid	8·84	11·2
Chlorine	3·83	4·9
Phosphoric acid	2·87	3·6
Persulphate of iron	4·22	5·4
Silica	3·77	4·8
Carbonic acid	17·60	
Charcoal and sand	2·22	100·
Loss	2·05	

100·

Water Wheel.



Section of a Gorse Mill—the box made of iron.

XXXIV.—*An Essay on the Advantages derived from the Use of One-Horse Carts.* By E. LOOMES.

THE advantages derived from the use of one-horse carts I shall here point out in the order in which they were brought under my notice on my own farm, and which are of course to be realized on all farms in proportion to their size.

The first advantage I derived was in stocking my farm, which contains about 230 acres, all arable, and would, under the waggon system, have required four waggons and four carts, which, if purchased new, would have cost as follows:—

	£.	s.	d.
2 waggons, at 30 <i>l.</i>	60	0	0
2 harvest ditto, at 15 <i>l.</i>	30	0	0
4 carts, at 12 <i>l.</i>	48	0	0
Total	£138	0	0

But by using one-horse carts, with fittings for harvest-work, my outlay was—

	£.	s.	d.
4 carts complete, at 13 <i>l.</i>	52	0	0

In order to prove, however, that there was a saving of 86*l.*, as appears here, it will be necessary to show that I am in no way inconvenienced by the entire substitution of one-horse carts for waggons and carts of a larger description. In the first place, there is no farming purpose to which waggons or large carts are applied for which one-horse carts are not also adapted, and it will be seen in the following table (which I have laid down from a careful observation of the capabilities of one-horse carts and waggons) that one horse in a cart is capable of conveying much more than half what can be carried on a waggon with two horses.

ONE-HORSE CARTS.		TWO-HORSE WAGGONS.	
Wheat-sheaves	172	Wheat-sheaves	207
Corn, cake, &c.	25 cwt.	Corn, cake, &c.	45 cwt.
Bones	60 bush.	Bones	100 bush.

The difference in the quantity of sheaf-corn carried by each, though small, may by some be considered a great disadvantage; but I think it matters not so much how many sheaves are carried at a time, as that the stacker should be kept well employed; and the little time that may be taken up in the extra tying on of the load is amply regained by the additional number of bottoms of loads the pitcher has to put up. Thus, for harvest-work, four carts with four horses are equal to four waggons with eight horses.

And again, for manure carting, four one-horse carts are equal to four two-horse carts, with these advantages, that being more

lightly built, and carrying somewhat less loads, they are not so liable to poach the land when wet; and the labour of the four horses thus saved not only enables me to get more forward with my work, but also to obtain more fully the advantage generally admitted of ploughing down the manure as soon as laid upon the land.

Though it requires one person to every 25 cwt., and with a waggon only one to every 45 cwt., it is not less economical, as I find a boy 14 years old, at 8*d.* a day, as capable of managing one horse in a cart as a man is of driving two in a waggon.

I think I have now clearly shown that a farmer is in no way inconvenienced by using only one-horse carts, and consequently 86*l.* may be saved by their use in stocking a farm of 230 acres. The next advantage I derived was in building a hovel to shelter my farming carriages, which cost 35*l.*: had I used waggons and carts, a hovel to shelter all would have cost upwards of 70*l.* The advantage derived from their use in summer is very apparent, when, having fallows to work and clover to carry, I do not materially retard the operation of fallowing by taking three horses to carry my clover.

In harvest four of my older horses carry all my corn; and the four younger being severely worked on the fallows, are rested to prepare them for wheat seeding and other autumnal work. There being seldom other work during harvest for horses than carrying corn, it may be considered no advantage to use only half of them, but it gives the farmer the opportunity of changing horses during a long day's work; and if any should be prevented from working, by accident or illness, he is not obliged to stop a team, which he must do did he employ all his horses in waggons. Carts are less destructive to the roads than waggons, because carrying more upon four wheels than waggons they consequently occasion less wear—but especially in a hilly country, where it is necessary to lock the wheels. It is there also that one-horse carts are much less dangerous than larger carts, because the shaft-horse having to regulate the pace down hill, can more easily do so with a one-horse load than with a two-horse load behind him. A horse is more able to recover himself, and consequently less liable to injury from falling, when drawing by himself than when another horse is pulling before him. The next advantage, though small, deserves attention, as it tends in some degree to lessen the annual expenses of the farmer, viz., carts being more easily turned and guided than waggons, the drivers are not so liable to knock down gate-posts or the corners of buildings. One-horse carts are indispensable on a farm, some parts of which require, on account of their distance from the farm-yard, more carriages for the conveyance of corn or manure to and fro than the number of

horses requisite for the working of the farm would be sufficient to draw if worked in double harness.

I do not consider that there is any saving of manual labour in the use of one-horse carts; and if the distance is so great from one place to another that a continued chain of carts cannot be kept up, the advantage gained is only the difference between two one-horse cart loads and one two-horse waggon load. But should both ends be kept employed in all our most busy times, such as bean-sowing, potato-setting, oat-sowing, turnip-sowing, hay-harvest, corn-harvest, wheat-seeding, and whenever other work is in hand besides carting, the farmer can gain or save the labour of as many horses as the number of the one-horse carts he employs amounts to.

The most economical application of horse-labour should be the study of all farmers.

Whittlesea, Peterborough.

XXXV.—*On the Farming of Cornwall.* By W. F. KARKEEK.

INTRODUCTION.

1. It is scarcely more than a century since the "mine" and the "seine" almost exclusively engaged the attention of the greater part of the inhabitants of Cornwall, and, as implied in our county toast, "*Fish, tin, and copper*," were considered the principal means to be relied on as sources of wealth and maintenance for its numerous population, whilst agriculture was neglected and supposed to be a secondary object. Only within the last fifty years has any claim been made by the county to be considered as an agricultural one; but great and permanent advances in the path of improvement have been made during that period, and examples of skilful cultivation may now be found dispersed over its surface which would not disgrace the best cultivated district in England. These, however, even were they more numerous, are not calculated to produce such an effect on the mind of a stranger coming from a better and more richly cultivated district, as cases of gross mismanagement; and hence, unfortunately, the latter occupy such a prominent feature that the whole of the farming of Cornwall is frequently supposed to be considerably worse than it really is. To use the words of a respected correspondent, an extensive landed proprietor, "we are improving, I hope; but we are in a transition state, passing from a very slovenly course of husbandry, by very unequal and incomplete degrees, to a better." It will be seen in the course of the 'Report' that our natural advantages as an agricultural county are far from

contemptible ; and at the present time there appears a felicitous concurrence of opinions and circumstances that favours the invention and acceptance of improved methods of husbandry ; and I confidently hope that this anxiety for improvement will at no very distant period be abundantly successful.

“ It is an easy thing to praise or blame ;
The hard task, and the virtue to do both.”

This I shall attempt by fairly placing before my readers the practices pursued—by giving praise where it is due—and, where any defects exist, by showing by example the superior advantages of a better plan of proceeding. To no class of men will this method of reasoning be better applied than to Cornish farmers ; for, generally speaking, there is not found among them such a host of prejudices, and such a strict adherence to old-fashioned customs, as many parties, who know them less, give them credit for.

Geographical Position, Extent, Agricultural Population, Size of Farms, &c.

2. Cornwall forms the south-west extremity of Britain ; the only county with which it is conterminous is Devonshire, which bounds it on the east-north-east. On all other sides it is surrounded by the ocean ; it therefore contains in proportion to its area a greater extent of sea-coast than any other county. It consists of 851,200 statute acres, about 200,000 of which are waste land. The estimated annual value of the several estates and farm-buildings, according to the last return made to the Clerk of the Peace in 1842, is 629,656*l*. It is divided into 9 hundreds, containing 27 market towns, 206 parishes, 13,000 villages, and 341,279 inhabitants. Of this population, 30,325 belong to the agricultural department, but not more than 25,800 are actually engaged in its employment. These are—

Farmers.	Farmers under 21 years old.	Male Labourers above 21 years old.	Male Labourers under 21 years old.	Female Agricultural Labourers.	Female Agricultural Labourers under 21 years old.	Total Persons actually engaged.
7,668	128	14,279	2,752	795	177	25,799

The whole of the agricultural population being to the total population 7-9 per cent. The proportion of farmers to the number of cultivated acres is exceedingly high—which arises from an immense number of small occupiers performing all the labour on the farms by themselves or families. According to Marshall's

Digest,' in 1831 we had 3613 persons of this description, and 4608 farmers who employed labourers.

3. The influence which this numerous body of small farmers exercises on the rental of farms in some localities is very considerable. Estates varying from 20 to 50 acres let at full 20 per cent. higher than those of 200 acres and upwards. But notwithstanding this, it is a question for very serious consideration, whether in many instances it would not be good policy on the part of the landlords, as those small farms fall in hand, to join three or four into one; for if we were to deduct from Cornish agriculture all the farms where the most approved systems of farming are pursued, we shall have left just the management of small farms. I do not mean by this that good management exists on all large farms—for, from the want of sufficient capital, a great many large ones are very badly cultivated; but it is a very rare case to witness anything approaching to good husbandry on very small ones. The improved and skilful management carried on upon farms of 150 and 200 acres occasions the production of a considerably greater quantity of acreable produce—in addition to which there would be a far greater certainty of the landlords obtaining their rents, although there might not appear so large a sum on their "rent-rolls."

Progress of Improvement since Worgan's Survey in 1810-11.

4. A brief description of the farming at the time of this survey will be sufficient to show the very considerable improvement since that period. The acreable extent of corn crops was probably as great as at the present time, which arose from the excessively high prices of wheat, averaging from 96s. to 112s. per quarter. Corn followed corn crop, until complete exhaustion threw the land out of production, and it was not a very uncommon case after a piece of ground had been completely exhausted by frequent tillage in this manner, to take a farewell crop of grain called "*nuda avena*"—a kind of naked oat, used chiefly for the feeding of pigs. The breadth too of green crops cultivated was very insignificant. This was the greatest defect in the husbandry of that period. Worgan mentions vetches as having been tried without success; carrots, too, had met with a similar failure; sainfoin and lucerne had been cultivated but by a few gentlemen by way of experiment; swedes had not long been introduced; and white turnips was the principal crop to be depended on. This crop was very indifferently cultivated; the drill system of husbandry had been practised by very few; hoeing was very imperfectly performed, and in many districts turnips were not hoed at all.

5. The greater extension of turnip culture which commenced

about 1815, and a better system of cultivation, soon produced a wonderful revolution in Cornish agriculture, more particularly after bone-dust became introduced in 1835, the effect of which on our light soils was an immense addition to the food consumed by cattle, which in their turn, producing a considerable increase of manure for enriching the soil, made an incalculable addition to the acreable produce. These are the results which the better knowledge of the improving age has already produced, and yet, great as they may appear to be, the means by which they have been effected have been only *partially introduced in any parish of the county*. The following table, exhibiting the proportions of white and green crops grown to the acreage of arable land in three different parishes, will prove this:—

Parishes.	Population, 1841.	Total Acreage.	Arable Land.	Rough pasture, roads, hedges, gardens, and wastes.	Wheat.	Barley.	Oats.	Turnips.	Potatoes.	Rape.	Vetch.	Cabbage.	Carrots.	Mangold.
1. Probus	1391	8513	6514	1599	391½	903	232½	487	76	132½	34	10	1½	3½
2. Ruanlanyhorn . .	444	2250	1826	424	228	340	98	109	133		3½			
3. Perranarworthal	1755	1713	1237	476	170	169	53	49	121		1			

In Probus we have just 26½ per cent. of corn crops, and nearly 11½ per cent. of green crops, including about 1 per cent. of potatoes. In Ruanlanyhorn we have rather more than 36½ per cent. of corn crops, and 13½ of green crops, including 7½ nearly of potatoes. And in Perranarworthal we have nearly 14 per cent. of green crops, of which more than 9 per cent. are potatoes. The first of these parishes is generally considered the best cultivated in the county—the second may be considered as a fair example of ordinary farming, where the potato culture prevails—and the last parish is situated near a mining district, where almost every cottager has his pig and plot of potatoes. I have selected these parishes purposely to show that even in Probus, which is considered to be the best cultivated parish, the quantity of green crops is not so great as might be imagined from merely surveying a few of the principal estates, where the proportion of green crop to white crop is more equal. This will be clearly exhibited as we proceed in our survey of the different districts.

The Varieties of Soils, their estimated Value, Acreable Produce, and Courses of Cropping.

6. The investigations of science have proved that there is a natural relation between the Cornish soils and the rocks beneath, which may be said to consist of *four distinct formations*—each of

which by decomposition gives origin to a peculiar soil, distinct in its nature and character, and requiring in some instances an appropriate system of cultivation—these are—

- (1.) *Granite*, giving origin to the "*growan soil*."*
- (2.) *Serpentine*, belonging almost exclusively to the Lizard district.
- (3.) *Schist or clay slate*, forming the largest proportion of land in the county.
- (4.) *Carbonaceous deposits*.

Besides which, dykes of *porphyry*, beds of *greenstone*, *hornblende*, and other trappean rocks, and veins of *quartz* and *limestone* will claim a portion of our attention as they effect an influence upon the soils beneath which they occur.

Granite.

7. The fertility of the soil on this formation depends greatly on the degree of its elevation and exposure. This is beautifully illustrated by comparing the Roughtor and Brownwilly district with that of the Land's-End, the former being 1296 and 1368 feet above the level of the sea—a greater part of which exhibits scarcely anything else but sterility and desolation, on which fogs are frequent and snow often falls before it is seen in the lower grounds, whilst the height of the latter district rarely exceeds 300 feet, and snow is seldom seen. Dr. Paris has observed that the relative fertility of this soil depends also upon its mineral structure. Granite is composed essentially of three minerals—*quartz*, *mica*, and *felspar*—its fertility chiefly depends, and is in proportion to the predominancy of felspar, due allowance being made for the varied conditions of weather to which it is exposed. Sometimes the quartz predominates, so as to constitute two-thirds or three-fourths of the whole rock—which difference, although overlooked by the geologist, produces important differences in the agricultural character of the soils, derived from their crumbling substances—the disintegration of which depends chiefly on the decomposition of the felspar. The felspar consists chiefly of a silicate of alumina in combination with a silicate of potash—the alkali forming the chief fertilizing ingredient; and hence soils of this character are celebrated for their abundant crops of grass. When this substance is exposed to the action of the water charged with carbonic acid, it slowly suffers decomposition, in such a manner that on the sides and slopes of hills the greater part of its alkali is removed altogether, and hence the hill sides on this formation are invariably barren, the clay being washed away, and nothing left

* Growan is the Cornish name for gravel.

but siliceous sand and gravel. The following are two analyses of granite,* assuming No. 1 to be composed of $\frac{2}{3}$ felspar, $\frac{2}{3}$ quartz, $\frac{1}{3}$ mica; No. 2 of $\frac{2}{3}$ quartz, $\frac{1}{3}$ mica, $\frac{2}{3}$ felspar:—

	No. 1.	No. 2.
Silica	73·04	74·84
Alumina	18·83	12·80
Potash	8·51	7·48
Magnesia	0·83	0·99
Lime	0·44	0·37
Oxide of Iron	1·73	1·93
Oxide of Manganese	0·10	0·12
Fluoric Acid	0·18	0·21

The presence of iron also exerts a considerable influence on the “growan” soils, tending to their improvement, whilst schorl, which pervades a great many of the granites, tends when in excess to impair them. In the hollows or levels where natural drainage does not exist, stiff clay-soils prevail, which are often cold and unfruitful, but are capable of amelioration where the depth of surface-soil is sufficient, by draining and proper cultivation. The growan soil is black, and the subsoil frequently of great depth and of a yellowish colour.

8. Commencing our survey of the granite soils at the eastern extremity, being the entrance to the county from the Devonshire side, the reader will be conveyed ideally over a ridge of bare and rugged rocks, running through the whole length of the county, from Launceston to the Land’s End; the commencement exhibiting the appearance of a dreary waste, and forming by far the most uninviting part of the journey. In the map,† *four insulated “outbursts”* will be seen, coloured red, which form this central ridge.

9. *The Roughtor district*‡ is about 10 miles in length and 6 or 7 in breadth—8794 acres of which are uncultivated waste. The cultivated portion, where the natural drainage is good, is parcelled out in small farms, let from 10s. to 15s. per acre. In the parish of Advent some are let as high as 20s. There is also a great breadth of land enclosed, forming rough pasture, let from 2s. to 3s. 6d. per acre. Oats and wheat are chiefly grown, aver-

* Sir H. T. De la Beche, F.R.S., &c., p. 449, ‘Manual of Geology.’

† The map which accompanies this Report is a fac-simile of Sir H. T. De la Beche’s index-map to the geological survey of Cornwall. It may be regarded as a true map of the soil, since there is no county in England where there is a greater relation between the soils and the subjacent rocks. The sections will also convey to the mind of a stranger the mode in which the various strata intersect each other.

‡ Ascertained by Mr. Stephens of Hengar, St. Tudy, for the purpose of this Report.

aging 25 per cent. on the acreage, producing from 20 to 27 bushels of the former, and 15 to 18 bushels of the latter. The land is seldom broken oftener than once in four or five years. The breadth of green crops averages from 5 to 10 per cent.; one-half or more is potatoes, the other turnips. The cattle average full 20 per cent. on the acreage—the farmers generally keeping as many as can be maintained alive during the winter. They consist generally of the common Devon kind; the cows averaging from 4 to 5 cwt., and a few oxen from 5½ to 7 cwt. In the summer they have the entire range of the “moors;”* but their progress in growth is very inconsiderable. There are but a few sheep kept, and those are of a very indifferent character.

10. *The Hensborough district.*—The soil on this “outburst” is of a better character; the farms average from 40 to 70 acres, with many above and below that range. The rental varies from 10s. to 35s. per acre. The ordinary cropping is to break three-years-old pasture for wheat, barley, and grass-seeds, with a variable proportion of swedes and potatoes preceding the wheat-crop. On the better cultivated farms a proportion of rape or pasture turnips, which is consumed on the land by sheep (not folded), precedes the wheat. The acreable produce varies from 20 to 24 bushels of wheat, from 28 to 38 of barley, from 36 to 48 of oats, and from 25 cwt. to 40 cwt. of hay.†

11. The third “outburst” includes the parishes between the towns of Penryn, Helston, Redruth, and Camborne, besides which there is a small outburst in the parishes of Germoe, Sithney, and Breage. The soil varies considerably. The ordinary cropping is to break four or five years old pasture for oats, barley, and grass-seeds, or oats and grass-seeds, preceded by variable proportions of potatoes and turnips. The acreable produce varies from 20 to 50 bushels of oats, from 20 to 30 bushels of barley. The cultivation of wheat is exceedingly limited except in Breage, Germoe, and in the vicinity of Penryn, where a fair breadth of turnips is also grown. In the two former parishes the cropping is wheat, then oats—without manuring—the potato and turnip with manure, after which barley and seeds. The average in these places is from 40 to 55 bushels of oats, and from 20 to 30 bushels of red wheat per acre.

12. The last “outburst” includes the Land’s End district and round by the west to St. Ives, forming a vast granitic surface,

* Great numbers of cattle are sent from other districts for summer pasturage on enclosed portions of the moors in the neighbourhood of Hawkes Tor, Butters Tor, &c.; but the benefit of this practice is very questionable.

† In this and every other instance where the value of the land and the acreage produce is mentioned, the amounts have been obtained from resident practical farmers, whose statements may be safely relied on.

and bidding defiance as it were to the northern Atlantic. This is a busy, active neighbourhood, the inhabitants being engaged in fishing, navigating, mining, or farming. The soil is exceedingly good, and notwithstanding its exposure to the sea, good crops of corn are grown on the verge of the cliffs 300 feet above the wave. The farms vary from 10 to 200 acres, few exceeding 100 or 150 acres. The rental averages from 30s. to 60s. per acre—a large proportion at 40s. The land in this neighbourhood lets exceedingly high from the peculiar character of the small farmers*—a hardworking race of men, who keep a number of milch cows, breed an immense number of pigs, and grow large quantities of potatoes. The ordinary course of cropping is to break three-years-old pasture for potatoes and turnips, followed by wheat, then barley or oats, and grass-seeds. On the better cultivated farms the rotation is generally turnips, wheat, potatoes, barley, and seeds; the breadth of green crops averaging from 20 to 25 per cent. The difference in the two systems is as follows:—

100 Acres.	Under Ordinary Management.	Improved System.
	Produce per Acre.	Produce per Acre.
Potatoes . .	From 8 to 12 tons	10 to 16 tons.
Turnips . .	18 to 20 tons	20 to 30 tons.
Wheat . . .	21 bushels	27 to 30 bushels.
Barley . . .	30 bushels	30 to 36 bushels.
Oats	40 to 45 bushels	45 to 50 bushels.
Hay	1 ton to 1½ ton	1½ ton to 2 tons.

Very few sheep are bred in this district, the farmers purchasing

* These farmers live chiefly on barley bread, fish, pork, and potatoes; the butter, and a large quantity of pork and potatoes, being taken to Penzance market, which is the cheapest pork-market in England. During the season, 300 head—about 170 dead and 130 alive—of swine are sent to this market once a week. The larger farmers keep a number of the old black dairy cows, supposed to be the aboriginal breed of the county. Many of these are rented by dairymen at 8*l.* per annum per cow, for which sum they have a quarter of an acre of potato-ground, 2 loads of turnips, 9 cwt. of straw, 72 fagots of furze, 100 turf, and 1½ acre of land for the keep of the cow. A renter of five cows has a dwelling-house, pig-houses, and potato-houses provided in addition. The calves belong to the dairymen. Numbers of these cottagers are sometimes located near or on a farm, forming a curious scene, the homestead being crowded with cows, pigs, men, women, and children,—

"*Ignemque, laremque,*

Et pecus, et domōs communi clauderet umbra."

store ewes in lamb at the autumnal sheep-fairs* in the eastern parts of the county, which are fattened and sold the following year. Few oxen are kept—but chiefly cows—a great many of the old Cornish black breed, averaging from 18 to 25 per cent. on the acreage, being preserved here for their milking properties. The pigs are exceedingly good and plentiful, averaging from 35 to 40 per cent. on the acreage.

13. The Scilly Islands should properly be considered here. The soil is of the "growan" kind, commonly black peat, mingled with granitic particles, and frequently blown sea-sand; in many places it bears fair crops of potatoes, barley, and sometimes wheat. The chief manure is sea-weed. The cattle, horses, and sheep are exceedingly small, being part of the native breeds of Britain preserved here in aboriginal purity. The pigs are numerous, and generally of a good description. This finishes our survey of the granite districts.

Grauwacke Group.

14. The country lying on the *slate rocks* is widely contrasted with that on the granite. The hills are smooth as if by art, and are so irregularly disposed, that they have not unaptly been compared to the waves of the sea, from their undulating character (33). Under the term "slate" we include all kinds of rocks, commonly so called, that are composed of sedimentary deposits, varying from the roofing slate even to a loose brown rubble, or becoming hardened, and so forming pudding-stones of great size. The colours are various—light grey, bluish grey, brown, whitish yellow, red and variegated—the red and variegated being generally considered the most productive. Within these argillaceous masses are discovered products of fire in various places. In districts adjoining the granite, felspar porphyritic rocks (provincially termed *Elvans*) traverse the slates in the form of dykes, varying from a few to 400 feet in breadth. The land where these elvans prevail is frequently covered by a thin layer of *quartz fragments* (provincially called *spar*), which abundantly traverse the slates in these districts. In other parts of the area we have igneous products which may properly be termed sedimentary, since "they appear to have been deposited in beds among the slates during their formation by the agency of water, after being ejected from fissures or craters in the shape of ashes or cinders, precisely as we might expect would happen at the present day with ashes or cinders discharged from insular and littoral volcanoes into the

* The principal sheep-fairs in Cornwall are held in the autumn, at Summercourt, Michell, and St. Lawrence; at Camelford, for early lambs, in July. The large cattle-fairs are held at Bodmin, Grampound, Probus, St. Lawrence, and Launceston.

sea.”* These accumulations are termed *sedimentary ash* (provincially *dun stone*; or when blistery, *honeycomb dun*). Their presence among the slates is a certain evidence of the fertility of the soil. In districts where these abound are discovered beds of *greenstone* and other solid *trappean rocks*, “which seem to have formed sheets or streams of melted rock,† amid the mud, silt, sand, or gravel then in the course of accumulation, and which now constitute associated beds of slate, sandstone, and conglomerates.”‡ Wherever these products of fire are discovered, the soil proves exceedingly productive. Again, in other portions of the slates we have accumulations of *calcareous matters*, and although never in sufficient breadth to give a character to the soil, yet they also are certain evidences of fertility. It is also observed, that the character of the soil on the slates is affected by their *inclination* or *dip*. Where the underlie is considerable and the subsoil shallow, the surface-soil is light and hungry, the soluble manures passing rapidly through the slaty fissures; and even where the *slates* lie *horizontally*, and are of an *indurated* character, with the soil of little depth, such land will scorch or burn readily in the summer. We have a great deal of cliff-land of this description (26).§

15. With these preliminary remarks I commence my survey of the soils on the slate district, which will be found to vary very considerably as respects their depth, texture, and fertility, these depending on the degree of mechanical division of the rocks, and their relative chemical elements, allowance being made always for the varied meteorological conditions to which they are exposed. This must not be lost sight of; the central granite ridge of hills, which has been already described, exercises a very considerable influence on the meteorological conditions of the different parts of the county. On the northern side of the ridge, at the eastern extremity, the effect of the winds from the Atlantic is very perceptible in the few trees which are exposed to their fury, and which grow with an inclination towards the opposite direction; whilst on the south-east side the climate is as mild as the south coast of Devon, of which it is a continuation, and with a difference of latitude not

* De la Beche.

† The intrusion of dykes and irregular beds of volcanic matter into the slate rock in the form of greenstone, serpentine, porphyry, and granite, is plainly seen throughout the whole of the county.

‡ De la Beche.

§ It is generally considered that at the junction of the granite and slates the soil is improved by the mixture. This is no doubt true as far as Penzance and a few other places are concerned, where the greenstones prevail; but instead of its being a general case, we have more commonly found quite the contrary effect produced from the indurated and altered state of the different slates at the line of junction, producing frequently a sterile effect.

very material. This part of the coast is beautifully wooded, and rich in pasturage, while in the valleys the most delicate plants will bloom. But where the granite range decreases in elevation to the westward, this difference in temperature is not so perceptible, for there the ocean-winds sweep across the narrower part of the peninsula without any interruption.

16. *Penzance district.*—Commencing the survey of the “slate formation” at Penzance, joining the granite of the Land’s End which we have just described, we have a beautiful example of fertility of soil proceeding from its mineral composition in conjunction with a genial climate. The soil is formed from a mixture of trappean rocks, chiefly greenstones with argillaceous slates. Greenstone consists of a mixture more or less intimate of hornblende and felspar, and is distinguished from the granite which it frequently joins by the absence of mica and quartz. The proportion of felspar varies, so that sometimes the greenstones become nearly felspar rock, while in other cases they are loaded with hornblende, the relative proportion of the latter causing a very material difference in the value of the soils produced from their decomposition. The following analyses show the chemical constituents of each :—

	Hornblende.	Felspar.
Silica . . .	47.21	65.21
Alumina . . .	12.18	18.13
Potash . . .	..	16.66
Lime . . .	12.73	..
Magnesia . . .	21.86	..
Proto-oxide of iron . . .	2.28	..
Fluoric acid . . .	1.50	..

This soil is an exceedingly rich and friable loam, oftentimes deep, and, as we may judge from the minerals which enter into its structure, is theoretically—as it is known to be practically—perfect. As an example of this, there are occasionally produced on it what cannot be realized in any other district in Britain—two crops of potatoes in one year—one acre yielding 300 imperial bushels of early spring potatoes (see No. 42), planted in November, and dug up in May and June—a portion of the same fetching 20s. per imperial bushel in the London market; and after this a crop of late potatoes, planted in June, and yielding 400 imperial bushels per acre. The usual method is first a crop of early spring potatoes, after which a crop of turnips. The method of cropping in other respects is the same as has been already described on the contiguous granite.

17. *From Hayle to Perranzabuloe, &c.*—Our route will now extend up the north coast. The soil in this extensive run of country is widely contrasted with that which we have left, being

in most instances exceedingly poor, partly clayey and partly loamy, resting on coarse argillaceous slates, abounding in quartz fragments, having various porphyritic and felspathic rocks (elvans) traversing them in every direction; and where the surface has not much declivity, there is generally found a clayey subsoil. We have a great breadth of this description of soil throughout the county, prevailing chiefly in the neighbourhood of the granite "outbursts." (*See analyses*, No. 72.) In the parishes of St. Erth and Gwinear some greenstone rocks are found, and in the neighbourhood of Camborne there is a deep marly subsoil, portions of which have been extensively used as a "marl" for manuring the poorer kinds of lands in its vicinity (61). This cannot be considered as much of an agricultural district; a great breadth of the land is taken up by mines; and though the soil may be poor and rarely of great value for agricultural purposes, yet the mineral treasures beneath the surface far more than make up for this deficiency.* There is also a great breadth of "wastes" in this district, which forms the character of a great deal of the lands lying upon the slate formation (72). The farms vary in size very considerably; we have a few large ones running from 200 to 300 acres, but by far the greater number average from 20 to 70 acres, besides an immense breadth of land parcelled out in small tenements belonging to working miners and cottagers which have been reclaimed from the wastes by those industrious individuals. The system of cropping, with the exception of a few farms in the neighbourhood of St. Erth, Gwinear, Camborne, and Illogan, is wheat, barley, and grass-seeds, with a small proportion of potatoes and turnips preceding the wheat. There are, however, excellent examples of good farming to be met with in this run of country. In Illogan parish, particularly, a better system has been introduced,—that of growing a fair proportion of swedes between the white crops. Lady Basset has been greatly instrumental in improving the farming of this parish.

18. Travelling onwards from Perranzabuloe to Mawgan by the coast, including portions of Newlyn, St. Enoder, and St. Columb Major, situated more inland in our route, we meet with another

* The mines are the great support of Cornwall: they afford trade to the merchant, profits to the adventurer, and employment to a most intelligent and a most moral class of workmen, through whom collectively the agriculturists find a ready sale for their produce. The direct value of the produce of our mines is $1\frac{1}{2}$ million annually, of which about two-thirds is paid for native labour. They are highly valuable in a national point of view, inasmuch as they have led to engineering improvements which have doubled the power of the steam-engine and kept foreigners in a great measure dependent upon us for the valuable metals they afford.

kind of soil consisting of a good, and in many instances deep loam, lying on a deep subsoil, formed from the gradual decay of the more sandy slates. In some parts of this district, calcareous beds and trap are found. The farms average from 70 to 120 acres, and there are a few exceeding 300 and 400 acres. The rental varies from 17s. to 30s. per acre; a large portion let at 23s. The system of cropping is to break three years' old pasture (occasionally two years') for wheat, followed by barley and seeds. On the better cultivated farms, from a tenth to a fifteenth of the wheat arishes* is put to turnips. This is considered the best wheat and barley district in the county; two-fifths are in constant tillage, averaging from 20 to 32 bushels of wheat, from 24 to 36 bushels of barley, per acre. The live stock average from 16 to 20 head of cattle, old and young; 25 to 30 breeding ewes; and from 5 to 10 pigs, on 100 acres.

19. Extending our route on the north coast from Mawgan to Padstow, we observe that the soils are not so deep, and that they partake more of a clayey character, except in the vicinity of Padstow, where beds of lime and greenstone are found, and the soils are more loamy. The land lets from 15s. to 30s. per acre; the largest portion at 20s. The system of cropping is to break three years' old pasture for wheat, followed by barley or oats, and seeds, with about 4 or 5 per cent. of turnips tilled on the lay ground previous to the barley, in which case wheat is not sown. A few farmers only grow their turnips on the wheaten arishes. The crops average from 18 to 24 bushels of wheat; from 24 to 27 bushels of barley; and from 35 to 40 bushels of oats, per acre. Live stock averages from 15 to 18 head of cattle, 20 to 25 breeding ewes on 100 acres.

20. Still pursuing the coast line, we arrive at a very important district, embracing a great many parishes, lying chiefly on red and variegated slates, interspersed with numerous bands of greenstone and "dun-stone" rocks, which are largely distributed in the vicinity of St. Endellion, extending onwards to Port Isaac. The dun-stone is of the blistery kind, the blisters being filled with carbonate of lime—an interesting fact in an agricultural point of view—showing that calcareous matter is disseminated through the accompanying slates. Where this kind of soil is found, it proves exceedingly valuable, averaging 38s. per acre; whilst other land in this district lets at only 18s. per acre. The following table will show the value of the soils, average rental per acre, and the per centage of stock kept and fed on 100 acres, in seven different parishes:—

* Stubbles are called "arishes" in Devonshire and Cornwall.

Parishes.	Character of Soils.	Rental.	Breeding Ewes.	Sheep Fed.	Sheep, Weight per Quarter.	Cattle Fed.
Egloshayle .	Loamy and shelfy .	s. 30	35	30	lbs. 18	3
St. Minver .	Clayey, shelfy, light.	20	25	15	16	1
St. Michael .						
St. Enodock .	Loamy, shelfy, and calcareous .	38	45	45	21	4
St. Endellion .						
St. Kew .	Clayey and shelfy .	28	35	20	18	2
St. Mabyn .	Friable loam and shelfy	35	40	35	20	4
St. Tudy .	Loamy .	30	30	20	18	3
St. Teath .	Shelfy and felspathic	18	20	10	17	1½

The ordinary system of cropping is to break two years' old pasture for wheat, barley, and seeds, and occasionally 4 to 5 per cent. of potatoes preceding the wheat. On the better cultivated farms the practice is to break three years' old pasture for wheat, barley, and seeds, with a sprinkling of swedes and white turnips introduced between these two corn crops. Here and there a fair breadth of swedes is sown, but the average of the whole district will scarcely exceed 4 or 5 per cent. of turnips. The average proportion of corn grown varies from

20 to 25 acres of wheat, yielding from 18 to 30 bushels per acre.

16 to 20 ditto barley, ditto 30 to 45 ditto.

4 to 5 ditto oats, ditto 36 to 48 ditto.

The greatest breadth of corn and the smallest yield per acre being produced on the worst cultivated farms.

21. Extending our survey still further on the north coast from Boscastle to Morwenstow, we arrive at the most northern point of the county. We find here quite a different geological formation from any other, constituting a part of the "carbonaceous deposits" of Devon and Cornwall. (6.) This district embraces a great many parishes, and can easily be defined on the map. Confining our attention to the "Stratton hundred" as an example, we find about three quarters of the country resting on beds of stiff yellow clay, "being the common product of the decomposed shales and sandstones," and affording a very unproductive soil, the greatest part of which requires thorough draining. On the northern part adjoining the sea coast, there is a thin stony soil occasionally intermixed with beds of clay, better adapted for sheep land than any other in the district; for from the shallowness of the soil, and the lands being much exposed, the winds careering without a single obstruction over the immense surface of the Atlantic, the crops are exceedingly variable. We have splendid coast scenery here; but to the eye of a farmer the very heath seems

poorer than in other places. The farms average from 50 to 150 acres, a few however running from 300 to 500 acres. The rental varies from 10s. to 25s. The methods of cropping are various. The land is generally broken at the end of three years for wheat, followed by barley or oats, and seeds; the large farmers taking a few acres of potatoes and turnips previous to the wheat, and a class of small farmers resident on the "moors" taking three corn crops in succession; the land in this instance is left free from tillage for a great many years to recruit itself. The average yield of corn is from 15 to 20 bushels of wheat, from 21 to 24 bushels of barley, and about 30 bushels of oats. There are only a few farmers * who pursue a different system, which is considered an improvement—wheat, barley, turnips and potatoes, barley, seeds. The yield on this system of farming is greater by 20 per cent. Owing to the cold, clayey, undrained character of this soil, the harvests are exceedingly late, and very few turnips are grown, not exceeding 1 per cent. of swedes, and $1\frac{1}{2}$ per cent. of white or yellow turnips in the twelve parishes. The cattle average 15 per cent. on the acreage—few being fattened, the rest sold in store condition.

22. Our survey will now extend to the borders of the "Carbonaceous series" on the schist formation, extending across the county from Lesnewth to Callington. The slate rocks are interspersed with beds of volcanic ash (dun-stone), sometimes blistery (honey-comb dun), graduating into greenstone and other trappean rocks. These form beds of great thickness in the direction of Davidstow, St. Clether, and Alternun, the run of which may be easily traced on the map. A band of limestone is found in Lezant and South Petherwyn, but not of sufficient breadth to give a character to the soil. The parish of Lewannick is much intersected with trappean blistery beds—the Barton of Trelaske lies upon this kind of rock—and they often occur in their line of strike, in a portion of a field only—the soil being valuable according to their tendency to decompose. In other places, layers of clay and shale predominate; these portions belong to the "*carbonaceous deposits*." A large portion of Lezant lies on this formation; and where the soil is badly cultivated, the "colts-foot" abounds and attains an extraordinary size. Again some of the slaty beds, particularly those adjoining the granite, are exceedingly hard and gritty, having a coarse siliceous character, and containing in their line of fracture abundance of spar. Lewannick, Lemollar, and Linkinghorn "downs" are strewn over with these sparry fragments, forming the character of the soils on the wastes

* In the parishes of Marhamchurch, Stratton, Poughill, and part of Launcells, the best cultivated part of the hundred is found. Some of it is really fertile, the rental averaging 25s. per acre.

of the district, which let at from 2s. 6d. to 4s. per acre. The soils on this very extensive area vary, as may be supposed from their different mineralogical characters—that on the dun-stone, green-stone, and other trappean rocks being exceedingly fertile—loamy, free, but not light, letting on the average at 24s. per acre; the rental ranging from 13s. to 70s. per acre; whilst others, being clayey and more or less loamy, vary from 5s. to 20s. per acre. The average rental of the parishes of Lewannick, Lezant, South Petherwyn, South Hill, Linkinghorn, Stoke Climsland, and part of Callington, has been ascertained for the purpose of this survey to be about 18s. 6d. per acre.* The ordinary course of cropping is wheat, barley, turnips or potatoes, barley or oats, and grass-seeds laid down for two years; the breadth of green crops on this rotation not exceeding 8 to 12 per cent. The corn crops yield about 16 bushels of wheat, 22 bushels of barley, and 28 bushels of oats per acre. On the better cultivated farms the rotation is different, being wheat or oats, turnips and potatoes, barley, and seeds for two years, yielding from 20 to 24 bushels of wheat, 30 bushels of barley, 36 bushels of oats, and from 27 cwt. to 30 cwt. of hay. The live stock in the district average from 20 to 35 breeding ewes, from 15 to 30 head of cattle, and 10 pigs on 100 acres.

23. We are now arrived at the banks of the South Channel and the borders of the Tamar, where we have a district of very considerable importance—from Calstock to the Rame by the Tamar on the east, from Calstock to Liskeard on the north, to the Looes on the south, bounded by the English Channel. The soil is generally light, free working and loamy, resting on red, grey, and variegated argillaceous slates, which are occasionally intermixed with sandy beds and with trappean rocks of “dun-stones” and compact greenstones. Where the trappean rocks abound, the land is let from 30s. to 32s. per acre. A great breadth of this formation is found at Liskeard, striking through Menheniot, to the south of Quethiock, Landrake, St. Germans, and St. Stephens by Saltash. Immediately on the banks of the Tamar, in the parishes of Calstock, St. Dominick, Pillaton, and Landulph, there is not much depth of soil, and it is of a clayey character, abounding frequently in bands of clay, which intersect the slates, making the land wet and springy in the winter. The farms vary from 50 to 300 acres; the majority under 100 acres. The

* We are indebted for much valuable information in this district to Edward Archer, Esq., Trelaske. He says the farms vary from 20 to 200 acres—averaging about 100 acres. The enclosures are exceedingly small—in Lewannick, for example, consisting of 3500 acres, there are no less than 1400 enclosures. This is a very common case in a great many other parishes.

course of cropping is to break three years' old pasture for wheat, then barley or oats, followed by turnips or potatoes, concluded by barley and seeds. The breadth of green crops averages 15 per cent., and very frequently a few acres of rape and potatoes grown antecedent to the wheat crop, and a few acres of vetches between the wheat and barley crops. On the best cultivated farms, the barley or oats after the wheat is frequently omitted; and there appears a disposition to adopt this course by the best farmers. On the immediate banks of the Tamar, owing to the facilities which this river affords for supplying the metropolis of the district—Plymouth and Devonport—with vegetables and fruit of all kinds, the farmer is induced to grow a large breadth of potatoes, which in this locality precede and prepare the land for the wheat crop. The corn crops average 18 bushels of wheat, 28 bushels of barley, and 42 bushels of oats per acre. Where the "dun-stone" rocks prevail, *the yield is full one-third more.* Permanent pasture in this district averages from 8 to 10 per cent., and hay varies from 1 ton to 1½ ton per acre. Cattle average from 15 to 20 on 100 acres, from 5 to 10 in the year being fattened; breeding ewes from 30 to 40, fattening from 25 to 30 sheep on 100 acres.

24. The next district on the south coast is bounded by Liskeard and the Looes on the east, by the Fowey river on the north-west, and the British Channel on the south. The intermixture of trappean rocks with the slates which characterized the last district is absent here. On the higher banks of the Fowey, the soils are partly clayey and partly loamy, resting upon a subsoil of deep rubble, consisting of clay slate, quartz, and loose yellow clay. This kind of soil extends to the elevated country inland, both north and south of the Fowey, particularly in the parishes of St. Winnow, Braddock, St. Pinnock, and in parts of Boconnoc, St. Sampson's and Lanreath, and is a very discouraging one to the agriculturist. Further south, in the parishes of St. Keyne, Duloe, Talland, Pelynt and Lansallos, St. Veep and Lanteglos, the soil partakes more of the loamy character, resting upon more compact subsoils, and this character may be applied to a very considerable portion of Boconnoc, St. Winnow, and Lanreath. The cliff lands are generally thin, producing scanty herbage, but owing to the extreme mildness of the coast district, sheep and other stock may frequently be seen grazing on the southern slopes, when snow and the severity of winter has covered and closed up districts further inland. There is a great quantity of woodland in this district; the Cornish elm, beech, and sycamore are found exposed in very high situations. The farms vary from 60 to 150 acres, and in price from 6s. to 25s. per acre. The usual method of cropping is to break three years' old pasture for wheat, barley or oats, and seeds,

with about 8 to 10 per cent. of potatoes and turnips antecedent to the wheat crop. The corn crops average from 16 to 20 bushels of wheat, about 24 to 40 bushels of barley, and from 32 to 40 bushels of oats per acre. On the better managed farms, where a greater breadth of green crops, particularly of turnips, is grown, the yield is full one-quarter more. The cattle average from 16 to 20 per cent. and breeding ewes from 25 to 30 per cent. on the acreage.

25. Still continuing our route on the coast line, we have a fair, fertile district, embracing the parishes of Mevagissey, St. Ewe, St. Michael Carhayes, and Gorran. The soil is of a loamy character, frequently inclining to the clayey, resting on brown, grey, and variegated slates. Limestone, associated with slate rocks of a semiporphyrific character, is found leading from Gorran Haven to Veryan Bay. At Gorran Haven we have masses of "quartz rocks," a vein of which runs through the parish. Where these intermingle with the slates, they form a tough, clayey soil, intermixed with pudding-stones of a "slag" like appearance. Land in immediate connexion with these quartz rocks is wet, cold, and unproductive. The farms vary from 20 to 580 acres; one of the largest (Bodrigan) in the county being situated here. The rental averages from 20s. to 25s. per acre. The ordinary cropping is to break three years' old pasture for wheat, followed by barley or oats, and seeds, with about 6 or 8 per cent. of potatoes and turnips previous to the wheat crop. On the better cultivated farms the method adopted is to put *half* of the old pastures into rape and pasture turnips—the former eaten off the land by sheep—which is put into wheat, after which barley or oats and seeds; the other *half* is put into turnips and potatoes, followed by barley or oats, and seeded out. The cropping on a *few farms* is wheat, turnips, barley, seeds, with a fair proportion of rape preceding the wheat. The corn crops average from 16 to 24 bushels of wheat, from 28 to 36 bushels of barley, and from 36 to 42 bushels of oats. On the better cultivated farms the average is full one fourth more. Hay averages about $1\frac{1}{2}$ ton per acre. Live stock averages from 18 to 20 cattle, chiefly cows; and from 25 to 35 breeding ewes on 100 acres.

26. The next district on our route embraces several parishes called "Roseland." The soils are of a more loamy character than the last described. Limestones are mingled with the slates in Veryan, and a small patch of serpentine and diallage at the Nare Head, but neither of sufficient breadth to give a character to the soils. On the cliff lands the soils are light, lying with very little subsoil on the slates, and burning exceedingly in dry weather (14). The farms vary from 50 to 200 acres, and are let from 20s. to 40s. per acre. A great many cliff estates, from

the advantages they have of procuring sea-weed, let on an average at from 28s. to 32s. per acre. The system of cropping generally pursued, is to break three years' old pasture for either potatoes, turnips, or rape, after which wheat, followed by barley and grass seeds. The crops average about 30 bushels of wheat, and from 36 to 45 bushels of barley; cattle average about 15, and from 30 to 35 breeding ewes, fattening and selling about the same number of sheep, on 100 acres.

27. Extending our survey further inland we find an exceedingly well cultivated district, embracing the parishes of Creed, Probus, Merther, Lamorran, Cuby, Cornelly, St. Michael Penkivell, and a portion of Ladock and St. Erme. The soil is of a light loamy character, resting on grey, brown, and variegated arenaceous slates. The farms vary from 50 to 350 acres; the rental from 15s. to 30s. per acre. The system of cropping formerly pursued was to break three years' old pasture for wheat, followed by barley, or oats and seeds, with 4 or 5 acres of turnips taken previous to the wheat; but a better system is getting very generally adopted, viz., wheat, turnips, barley, seeds, with a very fair proportion of rape grown previous to the wheat, as a preparation for that crop (44). The cattle average from 15 to 30; of which 6 or 8 are fattened and sold; from 25 to 35 breeding ewes—the produce of which are fattened and sold—besides others purchased at the fairs, on 100 acres. The corn crops average from 24 to 36 bushels of wheat, and from 30 to 45 bushels of barley per acre. Although the soils in many parts of the south coast are not so good as those on the northern parts of the county, yet from a better system of farming generally adopted, and from the mildness of the climate, a greater produce is frequently obtained. The expenses incurred by the northern farmers in manures are exceedingly small; the principal expense being the carriage of sand, whilst many on the south pay nearly *one-half of the amount of the rental* in lime, bone, and guano.

28. Still continuing the coast-line, we include in our survey all that tract of country situate between Penryn, Falmouth, and Helford. The soil is of a light loamy character, resting on grey and brown argillaceous slates, and lets on the average at 30s. per acre. In some places the slates are intermixed with trappean rocks of greenstone and hornblende. The soil in these localities is exceedingly good, letting at 70s. per acre, and is occupied by dairymen chiefly. On the same character of soil contiguous to Falmouth the rental varies from 4l. to 6l. per acre. The system of cropping generally pursued is, to break three years' pasture for a green crop—potatoes and turnips—followed by wheat—barley, and seeds. The exception to this rule is,—wheat or oats, turnips, barley, and seeds. Where the greenstones prevail, the

corn crops average 36 bushels of wheat, and from 48 to 60 bushels of barley; on the ordinary land 20 bushels of wheat, 34 bushels of barley, and 45 bushels of oats, per acre. There are only a few flocks of sheep kept; the farmers purchasing the ewes in lamb in the autumn, and selling them fat the following spring and summer.

29. The next district, usually called the *Meneage*, will finish our survey of the county. It comprehends 58 square miles, 25 miles of which are occupied by the serpentine formation, 25 by the slates, and the remainder is divided by *diallage*, *hornblende*, and *greenstone-rocks*. The southern portion of this district is known by the name of the Lizard Point, and forms at the same time the most southern promontory of Britain.

Serpentine.—The greater part of this formation offers a most marked example of barrenness: it is a flat table-land, retaining the water on its surface in every direction. It is characterized by producing a most beautiful heath—the “*erica vagans*.” Its unproductiveness is generally attributed to the large per centage of magnesia which it contains, forming with silica a silicate of magnesia, and having little or no lime or alumina entering into its composition.* It occasionally happens that veins of diallage and hornblende run through the serpentine, which intermixture adds considerably to its fertility: where this occurs, the land is rented from 18s. to 24s. per acre; but the general character in other respects is barren and unfruitful. The system adopted to cultivate the soil, in lieu of draining, is to plough deep water-furrows along and across the fields. Nothing, however, but thorough draining would avail here. The cropping is wheat, barley or oats, and seeds, with one or two per cent. of potatoes preceding the wheat crop. The wheat averages from 12 to 16 bushels, barley from 17 to 24 bushels, and oats from 28 to 36 bushels per acre.

30. *Hornblende*.—The contrast between this soil and the serpentine, which it adjoins, is the exact difference between an extremely fertile and a very indifferent one. Its surface is beautifully undulated, presenting a remarkable contrast to the flat, monotonous aspect of the serpentine (see section). Land on this

* ANALYSIS OF THE SERPENTINE ROCK.

Magnesia	36.68	40.64
Silica	42.50	41.95
Alumina	1.00	0.37
Lime	0.25	0.00
Oxide of Iron	1.50	2.12
Oxide of Manganese	0.62	0.00
Oxide of Chrome	0.25	0.00
Water	15.20	11.68
Carbonic Acid and Bitumen	0.00	3.42

formation will let at 40s. to 45s. per acre. The farmers designate it by the name of "Marle-soil," arising from their using as a manure this rock in a decomposed state, in which state it is found to a very great depth. The system of cropping is wheat, oats, turnips or potatoes, barley and seeds, laid down for three years. The wheat averages 34 bushels, barley from 40 to 48 bushels, oats from 80 to 96 bushels, and potatoes from 250 to 300 bushels per acre. (*See analyses of this soil—16.*) I would recommend the farmers in this locality to grow the early spring potatoes, which produce such a profitable return in the London market. The soil is similar to that of Penzance, with a climate in most places near the sea equally mild. On *Trevean* estate, in St. Keverne, this has been practised successfully.

31. *Diallage Soil*.—The rocks of this formation are chiefly confined to the borders of *Crousa Downs* (see section). They are massive and crystalline, projecting at the brow of the hills in immense blocks piled one over the other, and strewn on the sloping ground beneath, giving to the whole scene an extremely wild and rugged appearance. The rock is of a very Protean character, by some called *syenite*, and said to be composed of a coarse mixture of felspar, hornblende, and diallage. Sir H. T. De la Beche is of opinion that only a portion of this formation can be so considered, whilst the greater part is a true diallage. Of course the relative fertility of this soil will chiefly depend on the proportion of hornblende which enters into its composition.* Some of the land is let at 28s. per acre. The system of cropping is similar to that on the hornblende, but the yield is not so great. Wheat averages 24 bushels, barley 36 bushels, oats 70 bushels, potatoes from 200 to 250 bushels per acre. Farmers in the *Meneage* district breed few cattle or sheep, purchasing their stock at the eastern fairs and fattening for the butcher. Pigs are reared in immense quantities, averaging from 25 to 30 per cent. on the acreage. The remainder of the *Meneage* district lying on the slate formation is of the ordinary character, everywhere improved by the masses of greenstone which it intersects.

32. I have included in this survey every description of soil, and with the exception of some coarse land situate on the slates round or near the granite outbursts, almost every parish in the county. Those situate in the parishes of Germoe, Breage, and

* Mr. Whitley, in his 'Agricultural Geology,' gives the following analysis of this rock, when it is composed of two-thirds felspar and one-third hornblende:—

Silica	. . . . .	56.0
Alumina	. . . . .	17.0
Magnesia	. . . . .	6.0
Potash and Soda	. . . . .	12.0
Lime	. . . . .	4.0
Oxide of Iron	. . . . .	5.0

Sithney, and those in the western parts of Mylor, Kenwyn, and Kea, are of the same character as those already described, *as resting on coarse argillaceous slates abounding in porphyritic and felspathic rocks* (72). Those lying on the slates in the parishes of St. Withiel, St. Wenn, and Lanivet, are of a similar character, and likewise the soils in the eastern parts of Ladock, and western parts of St. Stephen's (68), and the slate soils of Warleggan, St. Neot, and St. Cleer (68). Most of those soils are siliceous, existing in the soils and clays in the form of quartz fragments, which intersect the slate rocks. The whole of these soils have been classed by Dr. Boase, in his contributions towards a knowledge of the geology of Cornwall, as belonging to the *porphyritic series*, in contradistinction to those abounding in trappean rocks of greenstone, &c., which he has named *calcareous*. But this distinction is by no means clearly defined, and is neither geologically nor chemically correct.

Drainage, &c.

33. We have in Cornwall two great systems of valleys, according to Dr. Boase's survey, "one running parallel with the central granite range, and the other intersecting the longitudinal valleys at right angles;" and as all the intermediate hills are more or less rounded, the country exhibits an undulating surface, which has already been compared to the waves of the ocean. Through these two great systems of valleys the fresh-water rivers flow, seeking outlets into the sea by the nearest continuous descent; receiving tributary streams from the lateral valleys which they intersect. On the granite districts the drainage is occasionally obstructed, so as to produce accumulations of clayey matters from the washing of the hills; and sedgy pools, and occasionally morasses or bogs are formed: these may be regarded as "*alluvial deposits*" of the modern kind. Very little in the way of drainage has been done towards reclaiming this kind of land; the principal operations being confined to the slate formation, which, from the peculiar formation of the hills, the eminences sometimes closely approximating, furnishing narrow passages for the rivulets, as well as from the porous nature of the rocks, affords no sites for the accumulation of water by broad expanse of hollow land. Here and there, where the breadth between the hills may be from 100 to 150 yards or more, marshy or moor land is found. There is seldom much difficulty experienced in obtaining a proper inclination for the discharge of water by *drains* in these cases; and when properly executed, an exceedingly rich and vegetable mould is formed, making the richest and most valuable meadow-land in the county. The drains in these cases vary from 3 to 6 feet in depth, and from 18 inches to 2 feet wide at the top, according to the depth, and from 16 to 18 inches at the bottom.

They are made of stone, having gutters, and filled above with small stones from 2 to 4 feet high.*

34. Draining is frequently required on our slate-hills, in consequence of the outbursting of springs, which break forth with great freedom in the winter months. The principle on which their drainage is effected is first to find the origin of the spring; and one single drain sunk into the water-bearing stratum, varying from 4 to 8 feet in depth, will lay a great extent of land dry. Should it happen that the water has soaked and become diffused through the soil, branches or small drains are necessary, which are so constructed as to fall into the main drain. These vary in depth from 18 inches to $2\frac{1}{2}$ feet, and are generally filled with small stones, without gutters, although in some cases these become requisite. We have very little tile-draining in Cornwall; stones are easily and cheaply obtained, except on the "carbonaceous soils" † (21).

35. *Improvement of the Soils by subsoil ploughing.*—This is an operation that has occasioned some little agitation of late. It has been practised in a variety of instances on different kinds of soils; on some with great success, and in others it has completely failed. Its advocates strongly recommend its adoption as a means of increasing the depth of all our soils; whilst its opponents maintain, that to augment a shallow soil by bringing to the surface an inferior subsoil, renders what was previously of some little value comparatively worthless. I believe that both parties are frequently wrong in their conclusions. This operation should never be resorted to unless the land has been either drained, or was completely dry; and in instances where the subsoil consists chiefly of siliceous and aluminous matters, it certainly is not likely to benefit a thin meagre soil. When potash and lime are present in the subsoils ‡ (61), it will certainly prove advantageous. Sub-

* Some of these levels require drains to the depth of 15 feet. The operator stands in the drain, cutting out before him, making the drain, and filling up behind him.

† Lady Basset has successfully thorough drained by the use of tiles about 60 acres on this formation at Whitstone farm, near Stratton. The whole of this kind of soil is beset with springs rising to the surface from clayey beds beneath. From the difficulty of obtaining stones, bush draining had been extensively practised previous to the introduction of "tiles," the latter being more efficient and durable.

‡ The 'Cornwall Agricultural Association' in 1842 offered a premium for the best 'Report of Experiments on Subsoil Ploughing.' Detached information on this subject having been published from time to time as the result of experiments in other counties, on soils different from our own, it was considered advisable that experiments should be made on the different geological strata in our own county. This produced a paper containing a series of experiments by Mr. Peters of Tehidy, on this subject, in 1843, which being unpublished, I insert by permission the three following experiments:—

Experiment 1. On Slate Soils.—In a field of 3 acres lying upon a slope

soiling is exceedingly beneficial in retentive clayey soils having a porous stratum beneath, for by breaking through the clayey bed the excess of moisture rapidly sinks, and the land is then rendered dry and healthy. On the granite, too, where drainage is not required, or has been successfully done, subsoil-ploughing is very successful. Its mode of action consists, in this case, of bringing up portions of the decomposed felspar (7) in the form of clay, which becomes mixed with the peat, the union producing an ameliorating influence on the "growan" soil. The application of the clay from the decomposed slate very considerably improves the growan soils, and again, the mixing of the decomposed felspar of the granite is found to be a valuable addition to the slate soils.

General Culture.

36. The crops most generally cultivated are wheat, barley, oats, hay, turnips, potatoes, and vetches; within the last twenty years, rape, cabbage, mangold, and carrots have been partially introduced on a great many of the best managed farms.

37. *Wheat.*—The process of preparing the land for this grain varies in the different parts of the county. When not preceded by a green crop, the grass-land is "ploughed to rot," or

of a clayey, shelly slate, the upper half had so little soil upon it that its general character was "poor"—thin and dry—with scarcely enough earth to cover a ploughshare. (See analysis of this description of subsoils (72) containing lime and potash.) Early in the spring of 1841 the half of this field was ploughed to a depth of 7 inches with a strong iron plough, and afterwards worked, manured, and cropped the same as the other portion of the field, by potatoes and mangold, crossing it at right angles, and the crop was nearly as good upon the upper half as the lower, where the soil was originally deep. In 1842 the field was sown to barley, and it proved a uniform crop, and not the least affected by the summer drought, as was previously the case. In 1843, and at the present time, it is grass, and a fair crop all over.

Experiment 2.—A piece of dry land of several acres, of a similar character to the last, lying on a sparry, clayey soil, was broken from grass in 1841, the worst part subsoiled, and the whole sown to turnips. The crop was an average one on the field generally; one-half was consumed by folding sheep on every alternate row, and the following year sown to spring wheat. In the winters of 1842 and 1843 the whole field was subsoiled right across the former subsoiling. In 1843 it was put into potatoes and mangold, both being a good crop, and beyond any expectation, considering the previous state of the ground—the benefit evidently being attributable to the subsoiling. About 200 cart-loads of spar stones were raised and removed in this operation, much of which was so near the surface as to intercept the ploughing even at 3 inches deep.

Experiment 3. On the Growan Soil.—A portion of a field situated in a hollow, generally wet with the water standing on the surface in the winter, having a crust, or "moorland pan," that prevented its escape. This was broken by the subsoil plough in 1841. The crop on this part of the field was equal to the dry portion, which was never the case before. In 1843 a fair crop of oats was taken, and the grass is at the present period exceedingly good, and the water has never lodged there since.

skimmed with a skimming-plough in July, soon after which it is worked with the harrow, and the roots, such as couch and weeds, collected, and generally burned, and the ashes spread. In some districts, lime is applied previous to the second ploughing, at the rate of 100 or 150 bushels per acre. In other districts a mixture of dung, earth, and sand, from 70 to 80 loads mixed, is used. The second ploughing takes place in October, when the seed is applied. On some parts of the south coast, on the cliff-lands, where a large proportion of the wheat follows potatoes or turnips, the tillage does not take place until after Christmas. The varieties of wheat are continually changing; but those most in use are distinguished by the provincial terms of *Old Cornish White*, and *Red Wheats*. Both of these are adapted to exposed situations. The former kind is used chiefly on the slate soils, and is supposed to "tiller" (branch) in the spring better than other varieties. This wheat weighs from 60 to 63 lbs. per bushel. The *Red Cornish Wheat* is cultivated chiefly on the granite soils; it is of a coarse quality, weighing from 61 to 65 lbs. per bushel, but not worth so much per bushel as the other to the miller. The seed is chiefly sown broad-cast; the drilling of wheat is only partially introduced, and dibbling is scarcely known. The cost of cultivating an acre of wheat in two different districts, the one bordering on the north coast, where sea-sand is easily obtained, and the other on the south coast, is as follows:—

SOUTH COAST DISTRICT.				NORTH COAST DISTRICT.			
	£.	s.	d.		£.	s.	d.
1 Ploughing "combing" *	0	7	6	1 Ploughing	0	7	6
Harrowing, burning, and spreading ashes	0	10	6	Harrowing, burning, and spreading ashes	0	10	6
100 bushels of lime	2	15	0	Carriage of 10 loads of sand, 3 miles	0	17	6
Carriage of ditto, 4 miles	0	12	0	Carriage of 50 loads of ditch-earth, &c.	0	10	6
Carriage of 25 loads of earth, and mixing with lime and spreading	0	9	0	10 loads of farm-yard dung, at 2s. 6d. per load†	1	5	0
Second ploughing	0	7	0	Mixing and spreading the sand, earth, and dung	0	5	0
Harrowing	0	3	0	Second Ploughing	0	7	0
Seeds, 18 gallons	0	16	8	Harrowing and sowing	0	3	4
Sowing, &c.	0	0	4	Seed	0	16	8
	6	1	0		5	3	0

* This is accomplished by ploughing the land in such a manner—from 2 to 2½ inches deep—that one-half of the turf is laid on the other half. At the end of 5 or 6 weeks this is well worked out, and the land is sometimes ploughed across, which is provincially termed "thwarting."

† The dung which is used in this district may be termed "straw dung." From the small proportion of turnips grown, few cattle are fattened, and hence the greater part of the dung is of a very indifferent character.

38. *Barley*.—This crop in Cornwall usually follows wheat. The usual method of cultivation is to plough the wheat stubble across the ridges (termed thwarting) in October and November; it is then harrowed down and cleaned, and the strob, roots, and weeds are collected and burned; the ashes spread previous to the second ploughing in February, and after harrowing and rolling until a tilth is obtained, the seed is sown, burying it 2 or 3 inches in the soil with the cultivator, and finishing with the harrow and roller. But this practice is an exceedingly bad one, being found to produce the very reverse of a good tilth; for the soil which has been acted upon by the winter frosts is actually turned down by the second ploughing, and a new surface exposed that has undergone no amelioration. The best of those farmers who persist in growing two white crops in succession, plough up the arishes deeply after harvest, and by ridging up the land before Christmas, all spring-ploughing is avoided, and the seed is sown in a better bed, and earlier than by the usual method. About 24 to 36 gallons of barley are used as seed per acre, and the grass-seeds sown at the time. The cost of cultivating an acre of barley and grass-seeds is as follows:—

	s.	d.
One ploughing—wheat stubble	6	0
One harrowing	3	0
Second ploughing	7	0
Second harrowing, sowing, tillage, &c.	10	0
Seed—barley	12	0
6 lbs. White and red clover	4s.	4d.
2 lbs. Trefoil	0	8
6 to 8 Gallons rye-grass seed	4	0
	9	0
	<hr/>	
	£2	7 0

39. *Oats*, which also generally follow the wheat crop, are put in with the grass seeds in one ploughing; sometimes the seeds are harrowed and rolled in after the oats are above the surface. We have an excellent variety of small black oats, weighing 40 lbs. per bushel.

40. *Hay*.—Having scarcely any permanent pasture, nearly all our hay is made from the first and second year's pasture in the rotation. Of late an improvement has been effected by introducing a portion of Italian rye-grass with the common kind. Mr. Corbett of Pencarrow, who has paid more attention to the growth of grasses than any other person in Cornwall, strongly recommends the farmers to use the following seeds for one acre, when the land is not much exposed and is intended to be two or three years in grass:—

- 7 Gallons rye-grass (half Italian, half Pacey's).
- 4 ditto Cocksfoot.
- 3 lbs. Roughed stalked meadow.
- 8 lbs. Red clover.

And where the land is intended to remain for four or five years in pasture (not permanent), he recommends white clover and trefoil to be added; and if the land be poor, a larger proportion of the cocksfoot, and less of the rough-stalked meadow. The consequence of sowing so large a quantity of common rye-grass, frequently as much as 12 gallons per acre, is to stifle every other kind of seed. Hay in Cornwall, with a few exceptions, is seldom cut until it is perfectly ripe, which not only depreciates the hay, but the pasturage afterwards. "In the blades and stems of the young grasses there is much saccharine matter, which, as they grow up, is gradually changed, first into starch, and then into woody fibre; and the more completely the latter change is effected, the riper the plant becomes, and the less soluble are the substances it contains." * Thus the ripening of grass-seeds not only seriously injures the hay, but in every instance takes away a very considerable portion of the decomposable matters in the soil, the exhausting effect of which on poor land is very considerable. Hence, both theory and practice indicate to the Cornish farmers the necessity of cutting their hay before it has attained its full stage of ripeness. Another error they commit is, that during the saving of the hay they expose it too long at one time to the rays of the sun, roasting it first on one side, and then on the other; after which it is carried to the rick. It is probable that the drying of hay in this manner occasions, to a certain extent, the change from starch to woody fibre after it is cut. Hence, the more quickly the drying is effected, the less extensively will changes of this kind take place; and this teaches the Cornish farmers another lesson:—the necessity of the hay being frequently turned and rapidly dried during the "saving." The crops of hay in Cornwall, and the grasses which follow, are miserable in the extreme, which proceeds partly from the method of "making," and partly from the system usually adopted of taking two white crops in succession, and laying the grass seeds down with the last one. This part of the subject will be considered at greater length (51).

41. *Turnips*.—The introduction of artificial manures, and of the manure seed-drill, has effected an important change in the cultivation of this invaluable root. Swedes should properly succeed the wheat, or lay oats; and when this takes place the land is

* See Karkeek's 'Essay on Fat and Muscle,' Jour. Roy. Agr. Soc., vol. v., part i.

ploughed as soon after harvest as possible. When grown on a grass-lay the first ploughing seldom takes place until Lady-Day, and the ground is worked sufficiently to cleanse it of weeds, as shortly after May as possible. In June it receives the seed-furrow, and the dung when applied is covered in by that ploughing. The seed is usually drilled on the flat surface, at 18 inches apart, with a machine that deposits the manure at the same time, which is generally bone or guano; and when dung is applied, either a smaller quantity of those manures or ashes of some kind are commonly drilled in with the seed. On many of the cliff-lands on the south coast, sea-weed is extensively employed for this crop, ploughed under the furrow with the first ploughing, in most instances producing a crop of white turnips; but generally, dung, bone, or ashes are employed also, in order to secure a good crop of swedes. The cost of producing an acre of swedes, grown after wheat, is thus estimated by two farmers:—

	£.	s.	d.		£.	s.	d.
3 Ploughings, at 6s.	0	18	0	First ploughing	0	7	6
4 Harrowings, rolling and } cultivating, &c.	0	15	0	Second cross-ploughing	0	6	0
3 Cwt. Peruvian guano*	1	16	0	Harrowing and rolling	0	7	0
Seed	0	2	0	20 Loads of dung, at 2s. 6d.†	2	10	0
Drilling	0	1	0	Carting and spreading	0	4	6
2 Hocings and singling	0	10	6	Third ploughing	0	6	0
				Harrowing and rolling once } over	0	5	0
				12 Bushels of bone-dust, at } 20s. per quarter	1	10	0
				Drilling	0	1	0
				2 Hocings and singling	0	10	6
	4	2	6		6	7	6

In the turnip prizes that have been obtained for the last five years at the winter meetings of the "Cornwall Agricultural Association" the swedes average 25 tons per acre, and 198 roots to the perch. The usual time of sowing white and yellows is from the 24th June to the 25th July. For swedes, from the latter part of May to the middle of June.†

* From 2½ to 3 cwt. of guano are used per acre. The Ichaboe was tried last season, and answered exceedingly well. I have witnessed some exceedingly good crops produced by 2½ cwt. of Ichaboe guano per acre.

† 2s. 6d. per load is considered to be full value for farm-yard manure, such as is generally made in Cornwall.

‡ "Storing of Turnips." The Cornish farmers have a dislike to the loss of the tops of the swede turnips, and a very common plan of "storing" is to cart the swedes in their entire state to some convenient meadow near the farm-yard, and there place them close to each other on the surface of the land, just in the same state as when growing—this is called "pitching." Others pile them up indiscriminately, without any protection from the weather, after having lopped off the "tops and tails." Others store them

42. *Potatoes*.—The cultivation of this root forms a very considerable part of the business of farmers in some districts, particularly those residing at Penzance, the Lizard, and on the banks of the Looe and Tamar.* The soil and climate of Cornwall are peculiarly adapted to the growth of the potato, the land being generally dry, light, and friable, and the climate moist and mild. An old lay pasture is preferred, which is well reduced by ploughing, tormenting, harrowing, and rolling, until it is brought to a fine tilth; it is then manured with dung or sea-weed, and latterly guano. This crop being generally considered to be a fallow-crop, most farmers pay considerable attention to the weeding.

in caves, and a few carefully pile and thatch them, to preserve them against the winter frosts. See the best mode of storing turnips in Cornwall in Jour. Roy. Agr. Soc., vol. ii., p. 225. Prize Essay, by Mr. W. E. Geach, of Cornwall.

* In the parishes bordering on the Looe, great quantities of potatoes are grown for the London market. In some of the parishes which adjoin the cliffs and the river, where sea-weed can be obtained at a small expense, the greater portion of the land intended for a wheat crop is first planted to potatoes (23). The preparation for the last-named crop commences in the months of January and February, by carting out the accumulated soil from the hedges into small heaps; if this should not prove sufficient, furrows are ploughed up across the field, and the soil also added to that which the hedge-grips produced. On these "bottoms" of earth, dung from the farm-yard, sea-weed, and sand are deposited and mixed together. The quantity of dung and weed amounts generally to about 25 cart-loads per acre; sand from 12 to 14 loads. The lay is then partly skimmed, the one portion being turned over on that which remains, and is called "turning to rot." After it has been "to rot" for two or three months, it is harrowed down fine, and if any couch appears, it is burned, but burning is not generally liked for potatoes, it being considered that the ashes cause the potato to be of a *soapy*, close nature. The manure is spread as the potatoes are planted, which is done by ploughing a furrow, into which the sets are dropped by women and children. A man follows and pushes in the manure on the sets with the back of a rake; the plough returns and covers the whole with another furrow; two small furrows are then ploughed without any sets, which gives place sufficient between the rows of potatoes. When the field, or a given portion thereof, is planted, the land is harrowed down fine, which completes the work. The potatoes are taken up as soon as they are ripe by men, women, and boys, with an implement called the "digger," having three prongs, like a dung-fork, only turned downwards instead of looking forward, as those of that implement. The price for "digging" the potatoes varies from 15s. to 20s. per acre; the produce averaging from 240 to 300 Winchester bushels of 8 gallons per acre, which in the season will fetch at the ship's side from 18l. to 20l. per acre. As soon as the land is clean of potatoes, the wheat is sown, after which a barley crop too often follows, without any other manure being applied to the land than that for the potato crop. The potato tillage is an enticing one at first view, promising as it does a fair profit; but since no manure is made by the crop, no portion of it being consumed on the farm, there is no provision made for another year's cropping beyond the sea-weed occasionally to be obtained at the sea-side."—*Communication from Mr. W. E. Geach, Author of the Prize Essay on Storing of Turnips.*

hoeing, and banking. The kinds of potatoes are numerous, but their names being provincial, would not be known in other localities. We have, however, two kinds which are known in the London market by the names of the "Cornish Reds," and the "early kidney."* The cultivation of the last kind is exclusively confined to the Penzance district, and they are raised sufficiently early to compete with the forced potatoes of the London market.† From 12,000 to 15,000 bushels of the early kidneys are sent annually to the eastern markets.

43. *Failure of the Potato Crop.*—The potato growers in Cornwall have met with considerable disappointment within the last few years from an unnatural or morbid growth of the plant. Sir C. Lemon has paid much attention to it, and an interesting paper on the subject having recently appeared from him in this Journal,‡ embracing all that is known at the present time, I refer my readers to the paper itself, merely adding that the "sets" sprout in a natural manner, but are stopped short before they reach the surface, and no leaves are formed. Large patches in the field are thus left bare, and when the ridges are dug up, it is found that these abortive sets have formed each a little button, about 2 inches from the surface, and, as it were, gone to rest after the effort. The country people give the name of Bobbin Joans to these abortive sets. It is very evident that we cannot consider this phenomenon as a disease, as we have seen some of the produce from those Bobbin Joans, that have been planted in Carclew gardens, which produced an abundant crop. Nume-

* We are indebted to J. Paynter, Esq., Boskenna, for the following account of the culture of the "early kidney potato:"—

"The planting commences the latter end of October, and continues until Christmas. Lay is best adapted for the purpose, which is turned down in a peculiar manner by hand labour, and a good tilth obtained on the surface by the dexterous hand of the workman. The manure used is generally sea-weed. The 'sets' are placed in the drill, a little earth thrown on them, and the sea-weed placed over the whole. A better plan is to place a little rotten stable-dung between the earth and sea-weed. The early potatoes are not banked up, but merely hoed, and this not after the middle of March. They are grown on the growan soils, but the most extensive breadth is on the greenstone rocks where they intersect the slate (16), in the fine sheltered districts near Penzance, 1000 acres of which, it is said, yield a rental of 10,000*l*."

"A few of the potatoes are taken up early in April, and these are worth 1*s*. 3*d*. per lb. on the spot (occasionally 2*s*. 6*d*. per lb.). These are not obtained by digging up the entire plant, but by carefully examining the root with the hand, and pulling off such tubers as may be sufficiently large. The root is then covered up again. The potatoes are full grown about the middle of May."

† The price of the spring potatoes sent to London per steam-vessel is about 3*½* guineas per cwt. The export continues till the price falls to 15*s*. and 10*s*. per cwt.

‡ See Jour. Roy. Agr. Soc., vol. iv. part ii. p. 431.

rous experiments have been made to ascertain the cause of this failure, but without success. Those most liable to the failure are of the most valuable kind, containing the largest proportion of starch, and it has been observed that seed obtained from the coarse grown soils is less liable to failure than when taken from rich arable land on the slate formation; hence the common practice of potato growers has been, for a long while, to obtain their seed from the granite districts.

These hints, if carefully followed, may lead to some practical results, as the proportion of starch varies considerably in different varieties.

44. *Rape*.—The culture of rape has been partially introduced with success as a preparation for the wheat crop, and food for sheep.* The method of cultivation, where the pasture is coarse, is to plough the grass deeply at Christmas, and, after it has been cultivated and well worked, lime or sand and dung are applied, but now more frequently guano or bone dust, which are drilled in with the seed, after the second ploughing in April. But when the land is free from strol and weeds, only one ploughing is required, which is done in March or April, with a “*turn-wrest plough*,” having a skim coulter attached, by which the rim of the soil is turned completely under the furrow.† This has been suc-

* The following experiment on the use of rape as food for sheep was made on Barteliver farm, where the practice has been to commence sowing in April, and continue until the latter part of July:—

5 acres, sown 13th and 14th of May, stocked to the 2nd of July.	
3 acres, ditto 21st of June,	ditto 2nd of August.
6 acres, ditto 10th of July,	ditto 21st of August.

These 14 acres kept (folded) from 68 to 110 sheep to the 2nd of November, averaging 80 in number during that period. On the 10th of August, 10 wether hogs were weighed that were feeding on the rape, and again on the 21st of September: the increase of weight is as follows:—

Average Weight of each Sheep, 10th August.	Average Weight of each Sheep, 21st September.	Average Increase of Weight in Six Weeks.	Average Profit of each Sheep at 6d. per lb.
146 lbs.	166 lbs.	20 lbs.	10s.

The difference between this system of farming and that of grazing the sheep on the thin pastures is very considerable. Suppose the gain on the whole flock to average only 12 lbs. of mutton, or 6s. each sheep, it would pay 6d. per week each for the keep, whilst the grass that would have grown on the 14 acres would be trifling compared with the profit from feeding on rape. The expenses, too, of the wheat crop which follows are greatly reduced, since the manure left after the folding of the sheep is far more valuable on light soils, than any lime which may be applied.

† It must be observed that in using this plough, *the land must be clean*

cessfully practised for many years in Probus, on Trewithen, Barteliver, and other farms. Mr. Tremayne, of Heligan, has written a very interesting paper on the cultivation of rape in Cornwall, in this Journal. He imagines, and very justly too, that a great part of the expenses of the wheat crop may be saved—particularly the *lime bill*—by the growing of rape and feeding of sheep. The cost of growing an acre of rape and wheat as practised on a coarse piece of land may be thus stated :—

	£.	s.	d.
1st. Deep ploughing	0	8	0
Cultivating and harrowing	0	7	6
2nd. Ploughing	0	6	0
Harrowing and rolling	0	7	0
2½ cwt. Ichaboe guano, at 8s. per cwt.	1	0	0
Seed from 6 to 8 lbs.	0	2	8
Expenses of sowing, drilling, &c.	0	1	0
	<hr/>		
		2	11 8
Expenses of producing a crop of wheat after rape :—			
1st. Ploughing	0	8	0
Harrowing	0	3	0
Seed and sowing	0	17	0
	<hr/>		
		1	8 0
	<hr/>		
		£3	19 8

The cultivation of the wheat crop by the old method, in the cheapest manner, can never be done much under 5*l.*, and when

and in good condition. The ploughing need not take place until March or April, which may be accomplished in wet weather when no other field work can be performed. The expenses of cultivating a crop of rape by this method are as follow :—

	£.	s.	d.
Skim-coulter ploughing	0	10	0
Harrowing	0	3	0
Guano	1	0	0
Seed	0	2	8
Sowing and Drilling	0	1	0
	<hr/>		
		£1	16 8

The skim-coulter may be screwed at any fixed height, so that in its progress through the ground it pares off the surface at the requisite depth, turns it over, and the slice thus cut off is buried by the common share of the plough beneath the soil. It is easily worked by two good horses, the draught not being more than 4 cwt. Another advantage in the use of this plough is, that in addition to the saving of labour, the land may be pastured up to the time of sowing. Very little harrowing is required, and the soil is in a better state to receive the seed than can be possibly obtained by any other method. I have seen wheat, barley, oats, turnips, and potatoes also, cultivated in this manner.

lime is applied, it will generally amount to 6*l.* per acre, thus making a clear profit of 40*s.*, besides the gain on the feeding of the sheep.

45. *Cabbage*.—The large drumhead cabbage has been partially cultivated as food for cattle and sheep; the produce varying from 20 to 30 tons per acre. The crops for which prizes have been awarded in 1842 and 1843 by the "Cornwall Agricultural Association" average 41 plants to the perch, and 27 tons to the acre.

46. *Mangold*.—The long and globe red and yellow varieties of this root have also been partially introduced. They are cultivated with great success both on the granite soils and slaty loams, varying from 25 to 35 tons per acre. The average weight per acre of those crops that have obtained the prizes for 1842 and 1843 of the "Cornwall Agricultural Association" is 28 tons, with 101 roots to the perch. The culture is very similar to that of the turnip, except that the land is ploughed deeper, and the supply of manure more liberal.

47. *Carrot*.—The large "Altringham" and "White Belgium" varieties of this root have been cultivated very successfully as food for stock on our deep loams, which require to be subsoil-ploughed for the purpose. The average weight per acre of the crops that have successfully competed for the prizes offered by the Cornwall Agricultural Association for the last three years is 27½ tons, and 303 roots to the perch.

48. *The Tare* has been cultivated for a great many years, both the winter and spring varieties: used as food for sheep, cattle, and horses.

49. *The following crops have been very rarely grown:—*

The Bean has been tried by Mr. Enys, of Enys, but with only partial success. "I have obtained," he says, "in most instances a full crop of stalks and flowers, varying from 4 to 5 feet high, but the flowers did not form pods due to the general appearance of the crop, and on the whole the yield was below the general average of the kingdom."

The Pea is more frequently grown, and with more success.

Rye is seldom grown except with tares.

Buck Wheat only as food for pheasants; but it deserves attention as a green crop, to be ploughed into the land as a preparation for the wheat crop.

Sainfoin and Lucerne have been grown by a few country gentlemen.

The Hop is not cultivated now, having been tried some 30 years since without success, our climate being too moist, and our soils not rich and loamy enough for its general growth.

50. *The Apple*.—Nearly all varieties of this fruit are grown, but we have one kind deserving of notice, the *Jelly Flower*, which is believed to be found only in Cornwall. It is a winter fruit, and one of great value. The orchards are generally much neglected: those situated on the south-east coast are the largest and best cultivated. Mr. Elliott of Landulph has been one of the most successful cultivators, and his system consists in keeping a nursery of young trees, which he never grafts until they have borne fruit, when, if not good, they are grafted with the best kinds. Mr. E. has 35 acres of orchard ground. His plan for renovating old orchards is to open the ground well, trenching it as deep as the soil will admit, and manuring it well with lime. The grass is consumed by pigs and sheep; and to renovate the old trees he scrapes them clean from moss and lichen, and washes them with gas lime, mixed with urine.

Cropping and Culture reviewed.

51. Having surveyed the various soils, the different systems of cropping, and the culture pursued, it will be requisite to briefly review them in a general way. In appreciating the merits of any system of cropping, we should correctly understand the object towards which the principles of good husbandry must be directed. *This consists in extracting from the soil, at the least possible expense, the greatest amount of produce, increasing at the same time the permanent fertility of the land.* Now it must be very evident that this can never be obtained by the general mode of cropping pursued in the county of Cornwall, which consists, with very few exceptions, of *growing two white crops in succession*. We have occasional glimpses of a different mode in the course of our survey, and one which I am happy to say is getting into fashion,—viz., *wheat, turnips, or other green crops, followed by barley or oats, and laid down to pasture for two or three years*. This has been named the *convertible system of farming*, from its combining stock farming with tillage, and is certainly a good one to delay exhaustion of the soil, which I fear is rapidly going on. In most of the rotations, the two white crops and the pasture that follows (generally once mown for hay, sometimes twice) are taken with one miserable manuring of sand, road-scrappings, and a few loads of farm-yard manure. The consequence of which is, that our pastures are very little better than half weeds, which accumulate during the three years they remain in grass, and to eradicate which, before a corn crop can be grown, the pernicious practice of “*burning*”* is really necessary. An idea of our *three years’ old*

* The practice of burning (stifle-burning) has a most pernicious effect on the land, for in all cases a very large per centage of the principal

pastures, as they are generally seen, may be gained from the following anecdote:—"An eminent London surveyor having occasion to value an estate in this county, on coming to one of those fields, denounced the land as extremely poor and of very little value. The next field he examined was in a state of tillage, 'and I have reason,' says my informant, 'to know that he put more than double the value upon it than on the lay field, although there was no difference whatever in the character of the soils.'"

52. There is only one rotation to which it is worth while to allude by way of argument, because it is one that is pursued by many respectable farmers, viz.: 1st. *Wheat*; 2nd. *Barley*; 3rd. *Turnips*; 4th. *Barley or oats*; and 5th. *Grass seeds for three years*. Generally speaking, the proportion of green crops is nearly equal to the barley crop in this case, which is one redeeming quality: besides, the grass seeds are laid down in good condition after the green crop, which is another redeeming quality; and it is true that very good farming may be witnessed on this rotation. The farmers manure the land well for the wheat and turnip crop; and on the whole are successful cultivators. Some of them, too, take a fair proportion of rape or pasture turnips previous to the wheat crop, which are consumed by sheep folded on the land. All this is very well as far as it goes, and on very good land it may and does succeed: and those who advocate this system point to the best managed farms on this rotation as examples of good farming; but unfortunately for the example, there are by far a greater number of badly cultivated farms than good ones; and on the generality of our light soils, one breadth of green crops is not sufficient to counteract the exhausting effect of three corn crops.

53. *Conditions as to Management*.—Much of the bad methods of farming in Cornwall is attributable to the "*conditions of management*" commonly expressed in the leases. I give two or three as examples:—

"On every breach of tillage, to take only two corn crops* (the last element of woody fibre, *carbon*, is wasted. The carbon uniting with the oxygen of the air forms carbonic acid gas, which flies off in the atmosphere from whence it was originally derived, instead of being slowly decomposed and given off in the soil as food for the plants. Woody fibre in a state of decay is the substance called "*humus*," the accumulation of which in a soil is incompatible with the continual burning which is so generally practised in Cornwall. The ashes which were originally derived from the soil are useful to vegetation according to the saline substances which they contain, but the amount of these may be ascertained from the simple fact that 100 lbs. of wheaten straw, strow, or weeds, leaves not more than 7 or 8 lbs. of ashes after being burnt.

* "A lease was drawn which came under my knowledge a short time since, binding the tenant not to take more than *three corn crops* in succession."—*Part of a Correspondence from Edward Archer, Esq., Treaske.*

crop to be barley or oats, and laid down with grass seeds), and to dress (manure) the same with 100 butt loads of mixings,* consisting of farm-yard manure, the scrapings of roads and ditches, and sea-sand.

"Or 80 bushels of well-burnt lime, mixed with a proper quantity of earth, on each and every acre so broken as aforesaid.

"Or not to lime oftener than once in nine years,† as a substitute for other manures."

That restrictions as to management of an estate are necessary no one can deny, but they should be so framed that, while the tenant is prevented from doing injury, he should not be so fettered as to prevent improvement, which is actually the case in the clauses we have mentioned. For hence arises the miserable system of breaking and burning the land, and taking two white crops in succession, with the latter of which it is sown down again with common rye-grass and clover, producing a "lay," poor in the extreme—half-pasture, half-weeds; and in which state it is compelled to remain by the lease (one-fifth of the land only being permitted to be broken once in three years), to the detriment of the farmer, the landlord, and the country at large. Again, what can be more ridiculous than compelling a tenant to take so many loads of ditch earth, or sand, or lime, under all circumstances? This part of the business should be left to the farmer, who, instead of paying 100*l.* per annum for lime, or 20*l.* per annum for the carriage of sea-sand, might prefer investing his money in dung, bone, or guano.

54. The whole range of the British proverbs—those axioms of the concentrated wisdom of a nation—does not include one more profoundly true than this:—"What should be everybody's business is nobody's;" and this will apply justly to those who are deeply interested in the improvement of the Cornish soils—the lords of the soil—who frequently suffer their estates to be managed in a most injurious manner; and instead of making an attempt to prevent it, actually perpetuate this system by indenture. There is a remedy for the evil; one that I do not propose in a hasty reliance on my own judgment, but after observation, reflection, and communication with some of the ablest farmers and of the principal landlords in the county—that a tenant should, in every instance, unless with permission, be restricted from taking two corn crops in succession, whilst in every other respect, and where it can be effected without injury to the rights of the landlord, I would recommend the carrying out of the system as much as possible

* Ten loads of farm-yard dung, 8 ditto of the scrapings of roads, or any other heavy stuff, 10 or 12 loads of sea sand, ditch earth, &c. to make 60 or 80 loads per acre.

† Some of our landlords are of opinion (and very justly too) that lime is too often applied instead of other manures.

unfettered; remembering that it is the interest of all parties, and more particularly the farmer, who has a fair term in the estate,* to raise the greatest possible produce from the land, without affecting its permanent fertility, by the most economical means.

55. It is imagined by many that the obstacles to a more rapid diffusion of agricultural improvement will be gradually overcome by the application of the sciences to its various practices. There are a few persons who entertain a higher opinion as to the beneficial effect with which chemical science and mechanical ingenuity may be profitably applied, in increasing and varying the produc-

* Farms are generally let for terms of 7, 14, and 21 years. The first is objectionable in every respect, and is a very great defect in the Cornish system of husbandry, which, combined as it was formerly, and is now occasionally practised, with the system of letting estates by "*tender*" to the highest bidder, forms the very acme of folly. The effect of this system is to introduce a class of tenantry on estates without either skill or capital, such persons being always ready to enter on a farm at an extravagant rental, and "contriving to shuffle through their term," by *racking* the estates in every possible way.

The "term" commences at Michaelmas, when the farm changes hands from the old tenant to the new one.

The landlord preserves a right to enter on the estate the last year of the term, and takes the ground next in turn for tillage, and prepares the same for wheat, turnips, and grass seeds, the tenant being paid reasonable compensation for the same.

The old tenant has the use of the barn and mowhay a sufficient time to enable him to dispose of his corn; the live stock and implements being generally sold by auction; the straw and dung belonging to the landlord.

There is a something wrong in this system: the tenant should be so situated that he could employ his capital to the best advantage up to the termination of his lease, for few farmers care about putting anything into the estate during the last 2 or 3 years of the term, but contrive to get all they can out of it. It has been recommended that where a lease of 21 years is given, there should be a renewal clause at the end of 14 years; or in a lease of 14 years, the clause should come into operation at the end of 7 years. Where there is a fair understanding between landlord and tenant, and which we are happy to say is more frequent than otherwise, this method would remedy a deal of the mischief complained of, for the farmer, let him be ever so rich, will be certain to proportion his expenditure to his interest in the land; for when he feels assured that he has a life interest in his farm, he will cast his whole lot in it, and will be certain to employ all his capital and skill in cultivating it to the highest point to which the improving state of agricultural science can direct him. Tenants in Cornwall pay generally tithes, land-tax, and all county and parochial assessments. By the leases they are bound to keep everything in repair except the walls and roofs. They also pay the expense of the leases.

The average rate of poor-rates is estimated at about 2s. in the pound on the rental. This rate presses, however, very unequally throughout the county. In the agricultural parishes it varies from 6d. to 1s. 6d., whilst on the same description of land, where the mines prevail to any extent, it amounts to 2s. 6d. and 4s.; the wear and tear of roads in the mining parishes being very considerable. The highway-rate also varies in the same ratio.

tive powers of the soil; but I should anticipate a hundred-fold greater improvements in Cornwall within the next fourteen years, if the landlords, "*one and all*," would adopt a better system in their leases. This was the practice of Mr. Coke, of Norfolk, afterwards Lord Leicester, who found, when he came into the possession of his property, that none of his lands would grow wheat; and some of it was refused at 5s. per acre. The Norfolk system at that time was to take two, and in some cases three, corn-crops in succession. After several years he succeeded in overcoming the prejudices of the farmers, and in introducing the white and green crop system, now called the "*Norfolk system of husbandry*;" and he lived to see those same lands, by good management, average from 32 to 40 bushels of wheat per acre. At the present time the larger portion of the estates in Norfolk are let for 21 years, and the term of the lease generally binds the tenant to follow the "*four-course system*;" no material variation being made without permission.

56. *The Norfolk system of husbandry* might be successfully introduced on most of our best farms where capital is not wanting; but the want of this essential requisite would prove an insurmountable obstacle to its general adoption in Cornwall: in addition to which there is not one-twentieth of farm buildings adapted to the carrying out such a rotation. A greater breadth of green-crops would be cultivated than is now grown on any farm in the county, a greater number of cattle would be kept to consume them, and suitable buildings would be required to feed them: and as the food increases, so would the farm-yard manure, which also would require receptacles to be preserved in. The green crop must, therefore, be proportionate to the white crop, and the cattle to the green crop.

57. *The convertible system of husbandry* is the one which will best suit the Cornish farmers, and their means, at the present time. In this system, the ground, after being laid down to grass for two, three, or more years, is broken up and sown with different species of corn, intermixed with green crops, after which it is again laid down to grass. The custom of allowing the land to remain three years in grass, need not be pursued under this method of husbandry, as it might be safely broken the second year.

I could adduce the names of some of the best farmers in the county who pursue this rotation; and, indeed, the landlords themselves, who farm any part of their estates, nearly all of them practise this method of farming, and these are the farms which were alluded to at the commencement of this 'Report,' as being "*examples of skilful cultivation, which may be seen dispersed over the surface of the county, that would not disgrace the best cultivated district in Britain.*" A great deal of bad farming in

Cornwall proceeds from the want of sufficient capital. The turnip husbandry is the only true system of improving the soil and increasing the profits on the farm; but a larger capital would be requisite than is now commonly employed where so large a portion of the land is brought round to the reproduction of corn by means of rest instead of green crops. In these cases it would be well if the farmer would consider the means at his disposal previous to entering on an estate, and not occupy more land than he can successfully cultivate. There is no mistake more common or more injurious than the supposition, that the more land a man occupies the greater must be his profits. The profit does not arise from the land itself, but from the mode of cultivation; and we could adduce many instances around us to prove that farmers properly managing small holdings are improving the soil and realizing fair profits; whilst others, on the contrary, on large farms, by bad management, are ruining their farms and themselves at the same time.

Manures.

58. It is an ascertained fact, that the food of vegetables consists of the materials of which they are composed. These are of two kinds—inorganic and organic. The first are *silica*, perhaps *alumina*, *potash*, *soda*, *magnesia*, *lime*, *iron*, *sulphuric acid*, *phosphoric acid* and *chlorine*. The organic are *oxygen*, *hydrogen*, *carbon*, and a little *nitrogen*. Our inquiry will not extend any further into the philosophy of the food of plants than to ascertain what sources Cornwall has in her own domain to furnish those materials.

59. *Silica*.—All our rocks have a large percentage of *silica*. The granite contains 70 per cent., the slates from 70 to 80 per cent., and the serpentine 45 per cent., which uniting with the basis of *potash*, *soda*, *lime*, and *magnesia*, form *silicates*, in which state of combination it exists in the substances of all living vegetables, particularly in the grasses, and in the outer part of the leaves and stalks.

60. *Alumina*.—This mineral is the principal ingredient of all clayey soils, which increase in tenacity in proportion to the quantity they contain. Its average proportion in the clay-slate rocks varies from 4 to 16 per cent., and in the granite from 15 to 20 per cent.

61. *Potash and Soda*.—Professor Liebig stated at the meeting of the British Association at York, “that he invariably found a large proportion of soda in vegetables growing near the sea coast; proving that plants could substitute soda for potash without injury to their growth.” “No plants,” he also said, “were found in which there was no potash, but there were very many which contained no soda.” The salt of the ocean (chloride of soda) can

be detected by the taste, on the blades of grass on the northern parts of the county, full ten miles from the sea shore. The application of sea-salt is found to act beneficially on soils in some inland counties, but it is seldom found of any service on those of Cornwall. This seeming anomaly is thus accounted for. There cannot be a doubt that most of our plants in Cornwall get quite enough of this substance without applying it in the shape of a manure; for when the ocean dashes with violence against the rocks, and the crests of the waves are white with foam, the winds carry away the spray, drifting it along in clouds and sprinkling it over the surface of the land. *Potash*, on the contrary, is found to be a valuable ingredient: it is contained in the granite rocks, averaging from 8 to 12 per cent.; in the *felspar*, from 15 to 18 per cent.; in the diallage rock, from 6 to 9 per cent.; in the clay slate, from 2·75 and 3·31 per cent.; in some of our marls, from 3 to 9 per cent.

The following analyses of some of them, made by Mr. Hunt, Curator of the Museum of Economic Geology, show this, besides a large proportion of lime:—

	No. 1.	No. 2.	No. 3.	No. 4.
Silica	60·9	63·	72·20	68·05
Alumina	19·10	13·10	14·00	15·00
Lime (carbonate) .	6·15	15·20	1·00	3·15
Magnesia	1·11	1·0	0·50	0·25
Potash	9·35	2·23	1·05	0·75
Oxide of iron . .	4·0	3·35	10·0	11·05
Manganese . . .	a trace	..	..	..
Sulphuric acid . .	·20	2·12	..	..
Sulphate of lime .	..	..	1·25	1·75

No. 1 is a marl found near Falmouth, used by the proprietor, Mr. Thomas Harvey, as a manure. No. 2 is a china stone, found on the same spot; Nos. 3 and 4 are specimens of the Camborne marls (17), which have been very extensively used as a manure for very many years. Potash is also found in our sea-weed, according to Professor G. Forchhammer,* in the proportion of from 5 to 8 per cent., which is used very extensively for manuring the land in Cornwall.

* Potash is not contained to any great degree in the sea—perhaps not beyond one grain in 1000. Professor G. Forchhammer stated at the meeting of the "British Association" at York, "it was his opinion that it is derived from the rocks, being washed into the ocean by the violence of rains, and thus, in the case of sea-weed as a manure, we are only restoring to the land that of which it had been deprived."

62. *Magnesia*, in combination with silica, forms nearly the entire mass of the serpentine rock (29). It is also found averaging 21 per cent. in hornblende, and 6 per cent. in the diallage; and in small proportions in the granite and clay-slate rocks; united with phosphoric acid, it forms the most valuable mineral manure,—the ashes of all descriptions of grain containing it, particularly the wheat plant, which cannot be grown without it.

63. *Lime* is found largely in the hornblende rocks, which contain from 10 to 13 per cent.; it is also contained in the dunstone, in nearly all our trappean rocks, and in a great many of the associated slates. We have a very great proportion of lime in our sea sands, the fertilizing properties of which are valued according to their contents of comminuted shell; the amount of carbonate of lime being a correct index of the quantity of shell, and of the fertilizing power in a given specimen. The following are the proportions of lime found in the sands from 14 different districts, by different chemists:—

1. Gwithian and Phillack . . .	70 per cent. of carbonate of lime.
2. Gannel (near the mouth) . . .	83½ „
3. Porth Towan	50 „
4. Portreath	25* „
5. Perranzabuloe	70 „
6. St. Mawes	64 „
7. Falmouth Harbour	80† „
8. Padstow sand	86½‡ „
9. Harlyn Bay	94 „
10. Trevoze Bay	91½ „
11. Blown sand from Bude	68 „
12. Beach sand do.	40 „
13. Stanbury Mouth	52 „
14. Widemouth	44 „

Besides carbonate of lime, these sands contain silica, alumina, and traces of oxide of iron. The shell also contains traces of phosphoric acid. In Worgan's time the carriage of sea-sand was estimated at 32,000*l.* per annum.§

* A large stream of water from the mines falls into the sea at Portreath, which has carried down in the course of ages the excess of worthless matters found in this sand.

† This is chiefly all coralline deposit, found in the bottom of Falmouth Harbour.

‡ It is calculated from fair data that 100,000 tons are annually removed from Padstow Harbour only, and over the whole county no less than 7,000,000 cubic feet are disturbed.

§ In Worgan's time the expense for land carriage only was estimated at 32,000*l.*; it is probably much greater now. Within the last two years a patent has been obtained for the purpose of calcining the north coast sand, this operation rendering it more soluble, and its action on the soil is thereby more quickly produced.

64. *Limestone*.—The supplies of limestone in Cornwall are very inconsiderable, and of an inferior description. The farmers are chiefly supplied with it from the coast of Devon. About five years since it was ascertained that 30 vessels were regularly employed in carrying limestone from Plymouth to Cornwall, and every harbour, nook, or creek, from the Rame-head to the Land's End has had lime-kilns for the purpose of burning it; but the consumption of late has not been so great. The quantity of lime used in Cornwall in 1843 was calculated, for the purpose of this Report, to be about—

1,280,000 bushels from Plymouth,
200,000 bushels raised in Cornwall.
<hr/>
1,480,000

Lime is seldom applied in a caustic state except on peaty soils, but generally after exposure for several weeks to the air. There is no substance the application of which has been so much misunderstood as this. Its effect on our soils is, *first, to supply a valuable constituent when wanting*, it being almost entirely absent from a large proportion of our clay-slate rocks; and next, to liberate *the silica, the potash, and the phosphates*,* besides the carbonaceous matters produced from the decomposition of weeds, roots, &c., to be administered to the wants of vegetation. But by this last operation no equivalent was furnished to the land for that removed by the crop; and hence the continuance of the system of *liming* has been proved to be nothing else than a rapid method of removing those ingredients, and thereby of exhausting the soil. Thus, where a farmer breaks up an old pasture for wheat, and after burning (which is another means of exhaustion), applies from 100 to 150 bushels of lime per acre, the crop is considerably benefited by the lime rendering soluble the nutritive ingredients in the soil—not always the supplying of materials which the soil might require. For very many years, this has been the custom in Cornwall in preparing for the wheat tillage; and for several years it was observed that those who carried the most lime on their estates raised the greatest crops, but now those same parties complain of the impurity of the lime, because it does not produce the same effect as formerly—not understanding the simple fact, that its repeated application has exhausted the soil of those constituents on which it formerly acted.

65. *Iron*.—This mineral is found abundantly in the form of proto and peroxides in a great many soils. The sulphurets and proto-sulphates are also occasionally present. The rapid disintegration

* See Professors Brand and Playfair's lectures, delivered before the members of the Royal Agricultural Society in 1843 and 1844.

of the granite, diallage, and greenstone rocks is partly owing to the presence of iron—the proto-oxide becoming a peroxide. The red and variegated colours of our slates (14) are owing to the proportion of iron contained in them.

66. *The organic Elements of Plants.*—According to Boussingault and other French authorities, the relative efficacy of all manures depends upon the proportions of nitrogen they severally contain—the farmer's principal source for which is farm-yard manure—consisting of the mixed droppings and litter of cattle, &c.; a large portion of the carbonaceous matters, too, is derived from the same source, which contributes its aid in increasing the produce of the soil by supplying a portion of the necessary food of plants. There is, we are sorry to say, no department of Cornish farming in which greater negligence is exhibited than in the preservation of manures. The farmers appear not to understand the simple fact, that all the better part of their manures—the liquid portions—will either run away or fly away. The first are seen in the fluids that drain from the dung-hills into the water-courses;—and the second may be detected by the sense of smell—the offensive exhalations of the manure heaps being the nitrogenised substances flying away into the air, and at the same time tainting it with effluvia. All animal and vegetable matters, or the remains of such, whatever purposes they may have served, or however valueless they may be esteemed, are fertilizers in some degree, if properly applied to the soil, and are in fact the manures which are suffered to run to waste more or less in almost every farm-yard in the county.*

* Many scientific gentlemen have endeavoured to enforce the necessity of the preservation of manures on the Cornish farmers, and among them we ought not to omit the exertions of Mr. Prideaux, an analytical chemist, who has repeatedly brought the subject before them. The following analyses of guano and of the solid matters of urine by this gentleman will show the farmers the necessity and the value of preserving the *raw material of guano in their own farm-yards*:—

Abridged Analysis of Guano.	Guano.			Solid Matters of Urine.		
	No. 1.	No. 2.	No. 3.	Human.	Cow's.	Mixed.
Ammoniacal salts, organic matters .	62.3	66.2	44.6	79.0	70.0	.75
Phosphates	23.7	29.2	41.2	8.0	2.3	.5
Alkaline sulphates	9.3	4.6	14.2	12.9	27.7	.20
Clay and sand	4.7	..	..	Mostly Potass.		

These analyses are abridged from analyses of good samples, the condensed statement of their composition giving a more practical view of it than the detailed analyses. It should be observed that alkaline sulphates

67. *Preservation of Manures.*—In order to prevent this excessive waste of valuable fertilizers, I recommend that liquid manure tanks should be constructed on the farm-yards—which can be done at a very trifling expense. We have very excellent tanks made in Cornwall of the large Delabole slabs of slate—the price of one holding 500 gallons being only 5*l.*, and so in proportion to 2000 gallons. And to prevent the escape of the gaseous portions of the manure, I recommend the mixing of it with gypsum, or, what I have found cheaper and even more valuable, the refuse of our alkali works, which is a double sulphate of lime and soda, 10 lbs. of which will be sufficient to fix the ammonia of 100 lbs. of urine. The dried peat from our granite wastes will be found an excellent absorbent for liquid manure.

68. *Artificial Manures* of all kinds have been used in Cornwall within the last five or six years. Bones, which were introduced in 1835, may be regarded as one of the most successful agricultural aids of modern days, as it has certainly been one great means of reclaiming our waste lands, and considerably improving the cultivated ones;—increasing the production of cattle, sheep, and corn, and thereby adding to the national resources required for an annually increasing population. I merely relate one experiment out of many,* to show the efficiency and permanent effect of this manure in reclaiming some waste lands adjoining Trelyon Commons, in the parish of St. Stephen's, the property of Mr. Hawkins, of Trewithen, under the superintendence of his agent, Mr. Trethewey.

A piece of several acres was enclosed in 1835 and put into turnips; one portion of it was manured with bone at the rate of 24 bushels per acre—the other portion of the field was simply manured with the ashes obtained from the breaking and burning of the land. In the years 1836 and 1837 it was successively cropped with oats, and then laid down to permanent pasture. At the present time, nearly ten years since it was first broken from the

contain more or less phosphates, chlorides, and carbonates. Human urine contains about 1 lb. of solid matters in 15 lbs., whilst that of cows and pigs is stronger. Three gallons mixed will yield about 2 lbs. and $2\frac{1}{2}$ lbs. of dry solid matters by evaporation; hence we see that the solid matters of urine are much richer in ammoniacal and organic matters than guano, and the cow's urine contains much potass. On the other hand, the guano contains a large per centage of the phosphates, important both for corn and turnips. About two hogsheads of urine are equal to 1 cwt. of best guano, and may be improved by the addition of half cwt. of fine bone-dust and some gypsum.

* It would be needless to discuss the various experiments made with this and other artificial manures, they having been already published by the author of this Report in a cheap form, and generally circulated throughout the county.

waste, which was nothing but heath and furze, the effect of the bones can be plainly distinguished as far as the eye can reach—as if a line of demarcation had been drawn between a rich grass sward and poor and scanty pasture. This and a dozen other experiments of the same kind have attracted the attention of a great many persons interested in agriculture; and the “*Probus Farmers’ Club*,” with a view of ascertaining whether the presence of bone could be detected by analysis, as it could assuredly be by the appearance of the pasture, sent samples of the soils—one from each part of the field—to Mr. Hunt, for this purpose; and with a view of testing that gentleman’s analytical abilities, he was kept entirely ignorant of the object of the Club. The following is the result:—

	No. 1.	No. 2.
Water evaporated by stove drying	14·06	14·18
Vegetable and animal matters burnt	12·01	12·05
Silica and siliceous grit	49·54	49·50
Oxide of iron	7·30	7·00
Carbonate of lime	1·05	1·06
Carbonate of magnesia	0·25	0·35
Sulphate of lime	1·05	1·04
Muriates	0·54	0·54
Alumina	7·10	6·04
Phosphate of lime	0·10	0·75
Phosphate of magnesia	0·0	·05
Potash	1·00	1·27
Humus soluble in alkalis	6·00	6·17

Thus it is proved that bone-dust remains in the land, and continues to act as a manure, for so long a period as ten years.

Waste Lands.

69. The object of the Royal Agricultural Society being not only to show what improvements may be effected by better farming on land already cultivated, but also by taking new land into cultivation, I shall proceed to show by what means a very considerable tract of waste land has been successfully reclaimed, as an example for those who may be pursuing the same laudable object. The wastes of the county have been estimated at about 200,000 acres; a large part of this extensive waste lies on the central ridge of the county, and there is a very large quantity between Launceston and the Indian Queen.

The greater part of these wastes is held in common—the farmers occupying the cultivated ground adjoining having right of pasturage (9). Extending over the central ridge we find other tracts of wastes, but I have no example to offer until we arrive at

the Land's End district, a large part of which is waste land, and would pay an almost immediate profit to the cultivator (70). As a proof of this, I have only to state that a very considerable extent has been, and is now in progress of reclaiming by cottagers, who obtain small plots of waste, on leases of three lives, which they cultivate, and build cottages on them. Land of this description, when not very rocky or boggy, may be reclaimed at 5*l.* to 6*l.* per acre—fencing not included, which varies according to circumstances. The fences in this district are built of granite; and the price for making a piece 18 feet long and 5 feet high (double granite wall) varies from 3*s.* 4*d.* to 5*s.* On taking land of this description into cultivation for the first time, the cottager does not attempt to grow wheat, but potatoes and oats; in the course of five or six years he introduces barley; and in ten or twelve years, wheat. This practice confirms the opinions of Liebig, that wheat will not grow on some soils, however rich in "humus:" the strength of the stalk is due to silicate of potash, which is found readily in a granite soil, but the seed requires phosphate of magnesia, which is nearly altogether absent; and hence the plant becomes a herb, but it does not bear fruit.

70. It frequently happens that the first crop of potatoes raised on this reclaimed land will more than repay the expenses. I witnessed 13 acres of this description of land at Colonel Scobell's farm—Botrea—worth from 16*l.* to 20*l.* per acre. This gentleman has been actively engaged for the last 45 years in reclaiming these granite wastes. It happened in the year 1804, that a tenant on "Leha estate,"—240 acres—was unable to pay the rent—90*l.* per annum. The Colonel commenced cultivating it himself. In 1806 he added 60 acres from the adjoining wastes to the estate, and in 1816, when the value of all agricultural produce was so considerably reduced from the war prices, he let the whole at 420*l.* per annum. This was accomplished at an expenditure of 3000*l.* Since that period he has reclaimed 150 acres more, forming "Botrea estate." Let the reader imagine a piece of waste, strewed over with granite blocks, some of immense size, with heath and furze shooting up between the interstices, at an elevation of 600 feet above the sea level, and notwithstanding these natural obstacles, I witnessed a short time since on this estate of only 150 acres (not many years since reclaimed from the Sancreed wastes) 130 head of cattle, Devons and short-horns, 100 pigs, and 35 horses and colts. The average produce is from 45 to 60 bushels of oats, from 18 to 21 bushels of wheat—not much grown—300 bushels of potatoes, and from 18 to 25 tons of turnips. I merely mention these circumstances to show what skill, enterprise, and capital will do, on some of the most exposed

parts of the western wastes, in reclaiming them with profit and success.

71. We had also an immense breadth of waste on the slate formation, which has been reclaimed by cottagers,* chiefly *miners*. The soil is exceedingly thin, resting on red or yellow gritty clay and coarse slates, abounding in quartz fragments, and traversed by mineral lodes and elvan rocks in every direction. The late Earl of Falmouth and Lord de Dunstanville gave a great impetus towards the reclaiming of this coarse kind of land, by granting pieces from 3 to 5 acres to cottagers on leases of three lives, at a small conventional rent of from 2s. 6d. to 5s. per acre, on condition of their building cottages on the holding. The parish value of those plots “358 in number on Illogan and Nancekuke Downs” now averages from 10s. to 20s. per acre. The Earl of Falmouth has nearly 2000 tenements of this description, which have increased in value since 1815 from 20 to 25 per cent. Other landowners have followed this example; and to give an idea of the extent of wastes which has been reclaimed in this manner,—the number of working miners is about 27,000; and it has been ascertained that out of 685 miners of whom the question was asked, 161 were possessed of cottages of this character.

72. The Messrs. S. and R. Davey, of Redruth, have broken about 100 acres of this kind of land from the wastes of St. Agnes Common since 1839. The cost of enclosing and cultivating, including the expense of the first crop, varied from 10l. to 11l. per acre. At the commencement of their undertaking, the land was manured with bone-dust and lime for wheat,—but the produce was only fit for pigs and poultry. The present method of cropping is swedes or pasture turnips followed by oats and seeds. The crops will average from 60 to 70 bushels of oats, and from 18 to 25 tons of swedes per acre. This has been effected entirely by the use of bone and guano. It has been correctly ascertained for this Report, that in the parishes of Perranzabuloe and St. Agnes there are 7037 acres of the same kind of waste, 5000 of which would pay handsomely for reclaiming. There is also a great quantity of the same kind in the parishes of St. Allen, Kenwyn, Kea, Feock, and Mylor, and in various other parts of the county (17). Analyses of the soils of some of them have been made by Mr. Hunt, at the request of Sir Charles Lemon, with a view of ascertaining the qualities of the raw material out of which improvements have been wrought, and in the hope that such knowledge may be available for future improvements.

* This bears a close resemblance to the allotment system. We have very few allotments in the county. Mr. Tremayne, of Heligan, has established some in his neighbourhood, which work exceedingly well.

Chemical Ingredients of the Soil and Sub-soil.	Surface Soil from a Plantation of Sir C. Lemon's, Bart., on Mylor Downs.	Sub-soil 18 Inches below the Surface Soil.	Clay from the same spot below the Surface Soil.	Surface Soil from a Piece of Waste near Hayle.
Silica and siliceous sand . . .	83.25	76.50	72.5	63.206
Alumina	4.10	10.10	12.8	10.013
Carbonate of lime	1.0	1.20	1.0	3.000
Carbonate of magnesia	0.15	0.25	1.15	0.066
Sulphate of lime	0.75	1.25	1.0	1.320
Per and proto-oxides of iron .	4.50	5.10	5.75	10.340
Deuto-oxide of iron . . . . .	..	..	..	2.060
Potash	2.25	3.0	4.25	1.000
Humus	2.0	1.15	0.75	3.000
Insoluble vegetable matters .	1.58	0.30	1.50	5.030
Muriates	0.42	0.75	0.47	..
Phosphate of lime . . . . .	..	0.25	..	0.010
Phosphate of magnesia . . . .	..	0.15	..	..
Soda . . . . .	..	..	a trace	0.005
Manganese . . . . .	..	..	..	0.010
Copper . . . . .	..	..	..	a trace
Loss . . . . .	..	..	..	1.000

Mr. Collins, of Truthan, has also reclaimed about 120 acres of the wastes in the parish of St. Erme, worth now 20s. per acre, which would not let at 2s. 6d. per acre previously. His system is to manure the land well with bone for turnips, one-half of which is eaten on the land by sheep folded on it—after this, barley, seeded out for 2 years, at the end of which time he breaks for rape, which is also eaten by sheep, and followed by wheat, turnips, barley, &c. Mr. Hawkins, too, of Trewithen, has reclaimed about 120 acres of the wastes bordering on Trelyon Common, in the parish of St. Stephen (68), chiefly through the agency of bone-dust. His system is to break the wastes for turnips, manured with bone-dust; after which oats, and then grass-seeds laid down for permanent pasture. One-half of the turnips are consumed by sheep folded on the land—and by these means he has brought land which would not fetch 2s. per acre, into a rich cultivated soil. There are a great many thousands of acres of wastes of this character of land in this district. (*See analysis 68.*) We have other descriptions of wastes in different parts of the county.*

* On the serpentine formation we have an immense tract of waste. This is decidedly the most unproductive soil in the county, and I should hesitate in advising its being cultivated, except in a few places where it is intersected by greenstone rocks (29). The whole of this land must be thoroughly drained, and would require an immense quantity of lime. The disintegrated greenstone and hornblende rocks have been employed as a fertilizing mixture for this kind of soil. The difference between this and the remains of decayed granite is that the potash of the felspar in the

Breeds of Sheep, Cattle, Horses, and Pigs.

73. *Sheep*.—In very few counties has so complete an alteration taken place in the character of sheep as in Cornwall within the last fifty years. The table of Mr. Luccock, in 1800, assigns to Cornwall 203,000 *short-woolled* sheep, producing 3382 packs of wool; while that of Mr. Hubbard, in 1828, makes no mention of the number of sheep, but of 5920 packs of long wool being yielded by the Cornish flocks. The county attributes this improvement chiefly to the exertions of Mr. Peters, who commenced as a flock-master in 1790, when he introduced, to use his own expression, “a waggon load of ewes and a ram” of the improved Leicesters, and continued crossing this blood with the native breed up to the period of Worgan’s survey in 1810. The Rev. R. Walker and Mr. Rodd also introduced some rams of this blood about this time (the produce being sold to the farmers for the improvement of their flocks), the effect of which may be imagined from Mr. Worgan’s description—“that we had as fine a breed of sheep as any county in England.” About this period (1810) Mr. Peters introduced two rams from a Mr. Kimber’s flock, in the north of Gloucester, who was a pupil of Mr. Bakewell, and who had, by mixing the new Leicester blood with the Cotswolds, become eminent as a breeder in that neighbourhood. These rams were crossed with Mr. Peters’s flock generally, until the year 1814, when he again introduced the new Leicesters from

latter is washed out by the rains; but when trap decays, the lime by which it is characterized is not readily dissolved, so that the marl which is produced is not only fertile in itself, but is capable of being employed as a manure for other soils. On the “*carbonaceous deposits*” (21) there is also a great breadth of waste, the whole of which would require thorough draining. I would recommend the enclosed land on this formation to be first drained and thickly planted, ere any attempt be made on the unenclosed portions.

The old tithe law was a great barrier to the cultivation of our waste lands. Mr. Wills of South Petherwyn, who has been employed in apportioning the rent-charges in lieu of tithes in a great many parishes, says, “Happily the question is amicably settled; the apportionments in the county are with a single exception confirmed, and I am decidedly of opinion that after a few years we shall one and all find it an improvement on the old system; for while it gives to the tithe-owner a better security, it holds out to the cultivator of the soil a great inducement to increase its produce, the good effect of which will be felt by the community at large. I conceive too that the settlement of this question will call the attention of the owners of the waste lands in the county to their cultivation and improvement (they being now tithe free), so many thousands of acres of which hold out to the capitalist a safe and profitable investment, offering labour to a vast number of the unemployed poor, besides increasing the production of food required for an annually increasing population.”

Mr. Cresswell's flock in Ashby-de-la-Zouch. Mr. Peters's system of breeding appears to have been a continual changing of blood, for either in 1816 or 1818 he again crossed his flock with the Gloucester variety, the effect of which was far from being satisfactory to the farmers, or probably to himself, for we find, from the documents furnished us, that in the course of three or four years afterwards he again introduced the improved Leicesters from Mr. Champion's flock, of Nottingham. This last cross proved to be the most successful one he ever made. From this time, down to the period of his sale in 1841, he twice introduced fresh blood from the Dishley stock, and once from the Gloucester variety, without any improvement. When we consider that during this time Mr. Peters was the only person who held public sales for the letting and selling of rams in the county, we may safely conclude that the Cornish flock at the present time possesses more or less of the Cotswold blood. Other farmers have introduced the pure Leicester blood within the last ten years from Devonshire, and from both Mr. Buckley's and Mr. Burgess's flocks, with considerable success. Among these we should mention Mr. George Bullmore of Newlyn, Mr. Doble of Probus, and Mr. Hodge of Perranzabuloe—the last two individuals being the principal stock breeders in the county.

74. The saving in the cost of production through the early maturity, improvement of fleece, and of form generally, is more than 50 per cent. The old breed were kept from two years to two years and a half before sold, and the best of them did not exceed from 10 lbs. to 12 lbs. per quarter. They are now sold at one year and one year and a half old, averaging from 18 to 24 lbs. per quarter. We have a few flocks of South Downs kept on some gentlemen's parks; and between the rivers Fowey and Tamar there is a breed found with tawny faces and legs—evidently of the South Hams variety; but these last have undergone great improvement by crossing with the Leicester blood, as they will fatten at one year and a quarter old to 20 lbs. per quarter. The Cornish farmers pay great attention to the wool, preferring breeding from the heaviest fleece, which affords a very desirable protection to their sheep on our exposed districts. The average weight of fleece is from $7\frac{1}{2}$ to 9 lbs.* To encourage a good fleece, and of sound staple, sheep require to be kept well in

* The wool in Cornwall is never washed on the sheep's back previous to clipping, but invariably sold in the yolk. This makes a difference in the price of wool, where washing is practised, of 25 per cent., the adding of which to the Cornish prices will make the rateable value of the washed wools of other counties.

We have been furnished with a list of prices of Cornish wool between the years 1830 and 1844—the average is $9\frac{1}{4}$ per lb. during that time.

the spring season; but it sometimes happens, from the scarcity of food—the general consequence of bad farming or overstocking—that this is not attended to; and the difference produced in the weight of wool only—on sheep of the same breed kept in different ways—is as much as 25 per cent.* The principal disease to which our sheep are liable is scouring, which is referable to deficiency of food at one time, and excess of it at another.

75. *Cattle*.—The breeding and rearing of cattle forms no inconsiderable item in the agricultural economy of the county. A rough estimate of the number bred annually has been made by Sir Charles Lemon, by calculating the number of hides tanned in 1839, and the number exported and imported, which the writer is permitted to make use of. The result is as follows:—

Store cattle, sold to the eastern dealers,	£.
averaging from 5½ to 6 cwt. each . . . 3,500 at 10 <i>l</i> .	35,000
Fat cattle ditto ditto . . . 1,200 at 15 <i>l</i> .	18,000
Cattle killed in the county . . . 15,950 at 15 <i>l</i> .	239,250
Calves ditto ditto . . . 11,550 at 25 <i>s</i> .	14,437
	<hr/>
32,200 head . . .	306,687
There are also some fat cows and a bull occasionally imported, which may be estimated at	
900 head . . .	10,800
	<hr/>
31,300 head . . .	£295,887

The original breed are of a black colour, but few only of these are found at present: the Devons are now the prevailing breed.

* Sheep are very rarely turned on the turnips without being hurdled; the general practice is to cart the roots on the arishes or pastures intended to be broken next in rotation for turnips, besides which, a little hay, and sometimes barley and oats, is afforded them during the severe weather by the best farmers. We are aware of but two instances of feeding sheep under sheds, practised by Mr. Snell of Wayton, Landulph, and by Mr. Lawry of Tregarton, Gorran.

Mr. Snell's shed is 70 feet long, 12 feet wide, having a yard attached about 50 feet by 20 feet. This will contain 50 sheep. They are fed three times a day with sliced turnips, in a manger placed against the inner wall the whole length of the shed. The yard and shed are prepared by laying down during the summer 6 inches of earth (sand is used by Mr. Lawry), and upon that are placed hedge parings (which are cut, ricked, and thatched for the purpose) and stubble, so that when the sheep are first introduced, there is a bed about 1 foot in depth, and upon which is afterwards daily laid straw or hedge parings from the rick. When the bed becomes inconveniently high for the manger, it is removed, and a fresh one applied. Mr. Snell adds, "I have not found my sheep kept in this manner more liable to disease than others, except the *foot-rot*, which was easily prevented by carting a quantity of earth in the form of a mound in the centre of the yard, upon which were occasionally strewed small quantities of slaked lime, and this simple remedy has ever since entirely prevented the disease."

The purest stock of the new kind are found at Trebartha, where they have been bred with the greatest care for the last forty years,—the late Mr. Rodd having obtained the best of the kind from the neighbourhoods of North and South Molton; but notwithstanding the care and attention that have been paid to obtaining the purest Devon stock, by him and other breeders, the cattle reared in the north of Devon are still superior to our own, having generally richer coats, and more correct symmetry. This degeneracy has been attributed partly to the herbage and partly to the climate of Cornwall.

76. *Short-Horns*.—Within the last 22 years, short-horns have been introduced on many farms through the exertions of Mr. Peters, who first purchased some cows from Mr. Wilkinson's stock, of Penton, Nottingham, and a bull* of Mr. Smith of Dishley. Other heifers followed from Mr. White of Leicestershire, and again from Mr. Wilkinson's stock.† Some years after, he introduced a bull,‡ which was purchased for him at Mr. Mason's sale by the Earl Spencer. These laid the foundation of the short-horned breed in Cornwall. A few others have been lately introduced by Messrs. Hendy, Tilly, and Scobell; but the greatest portion of the present breed is derived from Mr. Peters's stock. Much discussion has taken place from time to time as to the comparative merits of the Devons and Short-horns. The advocates of the former contend that the natural and artificial productions of Cornwall are unsuited to maintain such a breed of large cattle as the Short-horns, and that the Devons are a hardier race, and better adapted to our changeable climate. The advocates of the Short-horns maintain, on the contrary, that theirs are more certain breeders, better milkers and graziers than any other kind. This is an interesting question. In the rural economy of a district, a high degree of importance is to be ascribed to a knowledge of the distinctive characters of the domesticated animals, since much of the profit derived from them will depend upon adapting the breed to the circumstances in which it may be placed; and there cannot be a question that on most of our hilly farms, with a short bite of grass, the Devons are preferable; but wherever there is a fair proportion of food, the Short-horns are by far the most profitable.

77. *Crosses*.—It has been a common practice of late to cross the common Devon cow with the short-horned bull,§ which

* Alfred, 24. Red roan, calved July 20th, 1820, got by R. Collings's Lancaster. Dam, red roan, by Alfred; grand dam by Windsor.

† Lady, Peta, Alexandria.

‡ Mercury. 119, Coates's Herd Book.

§ The writer is furnished with a document from J. H. Tramayne, Esq. of Heligan, proving that crosses with the Devon and the Teeswater breeds

generally proves successful,—the stock being full one year in advance, in both weight and early maturity, compared with the common average of the Devons. The consequence of this crossing will, however, soon prove injurious, unless care be always taken that pure blood be on one side—the male generally; for where both sire and dam are only half bred, which is sometimes the case with us, the third cross proves a most mongrel stock indeed. Crosses with the Hereford bull have also been successfully made in the south-eastern parts of the county, particularly in the neighbourhood of St. Germans, where this breed has been carefully preserved by the late Earl of St. Germans for the last twenty years.

78. *Feeding of Cattle.*—The usual time to take the cattle into the houses to feed is about the months of October and November, when they are fed on white and yellow turnips, straw and hay, until March: after this on swedes, straw, and hay to the fattening in June. Others feed on straw and turnips until February; and hay, straw, and swedes until May, and finish on grass afterwards. Others, we are sorry to say, rear a greater number of cattle than they can properly feed, which are kept in a half-starved condition, either in the yards or lanes in the winter, and turned out on the fields in the spring, and on the rough pastures, or commons, in the summer. Cattle thus kept are sold from four to six years old, varying from 10*l.* to 14*l.* each, and driven by the eastern jobbers up into the pasture lands of other counties to be fed. Some of our best farmers give small quantities of barley during the fattening. Oil-cake is seldom if ever used, and has scarcely been seen by one farmer in a thousand. The common Devon ox, fed in the general way, and with ordinary care, averages 7½ cwt.; cows 5 cwt.; and very many oxen will reach 1000 lbs. weight. Good shelter, warm litter, wholesome and abundant fodder, are the necessities which fortify our stock against the attacks of winter; and through these, sleekness and good condition—which are the only signs of health and prosperity in the animal—are preserved. There should be no cessation in the rearing and feeding of cattle: those that are stuffed and starved by turns are certain to prove unprofitable to the feeder in every way; for here it is that the inroads of disease are first to be apprehended, and here its attacks will be certain to prove formidable and fatal. The diseases of cattle are neither numerous nor very fatal. The “pleuro-pneumonia” has lately occasioned the death of thousands in other counties, but has

were made a great many years since in Cornwall, some of that blood having been introduced by the grandfather of the present Earl of Falmouth, at Tregothnan, in 1790.

never visited us; and the "vesicular epizootic," which was prevalent here as elsewhere in 1840, did not prove dangerous. The most formidable diseases are diarrhœa, dysentery, constipation, and red water, which are too frequently occasioned by injudicious feeding, and the want of proper care and treatment.

79. *Horses*.—There is no subject connected with Cornish farming in which greater neglect is exhibited than in the breeding and rearing of horses. Our stock is generally bad, which is partly attributable to the mares, partly to the stallions, and partly to the method of rearing. The brood mares are not of a very superior description, many of them showing the bone and muscle in the wrong places—too much in their heads and necks, and too little in their limbs; but a great many are strong, active animals, varying from 14 to 15 hands high. These do not cross well with the thorough-bred stallions,* the produce being a weedy, trashy race, too light for the general purposes of riding or driving. The majority of the stallions that have been introduced have been unfortunately either broken down by premature labour, or having exercised their vocations, and been condemned as breeding stallions in other places, have been sent into Cornwall by way of a finish. A correspondent,† who has bred from some twenty-five mares of good figure and size with the blood-horses, says, "that he is correct in stating that not one colt in the whole lot turned out well." The farmers, seeing the effect of breeding in this manner, have for several years encouraged half-bred stallions of size and power, and in cases where they have possessed sufficient action, the produce have answered extremely well; for, where they have not succeeded as gig or saddle horses, they generally make strong and useful labour ones on the farms. But where, from want of proper selection, the males have been wanting in that necessary quality (action), and more particularly when this is absent also on the dam's side,—which is frequently the case,—the produce proves of very inferior character indeed. Our soils being generally light, our horses also are of a light description. The greatest part of the heavy draught breed are supplied from North and South Wales, and Shrewsbury; their prices varying from 15*l.* to 25*l.* each, at three years old. These

* Some years since, with a view of introducing a stallion for the purpose of improving the breed of saddle-horses in Cornwall, I consulted with Mr. Youatt on the subject, and he recommended an Arab stallion. With many of our mares, such as those possessing heavy heads and necks, and thick, upright shoulders, the cross would do a deal of good, and could not possibly do any harm. The principal object is to obtain a compact frame and vigour, and we possess these qualifications in an eminent degree in the Arab; after which, if size and power were required, the female progeny might be crossed with an active "Cleveland bay."

† Mr. Trethewy of Trewithen, Probosc.

were introduced as the fashion prevailed for better appointed horse-teams, and the working of horses instead of oxen.

80. *Rearing of Horses.*—A great deal of mismanagement occurs in this department also, for it frequently happens that the young animal is introduced tolerably perfect into the world, but is rendered useless by our system of rearing. This proceeds from a mistaken economy on the part of the farmers, many of whom consider any keep good enough for this description of stock, and they are consequently often left to struggle through a winter as well as they can, unhoused, unsheltered, and with no food but what they can grub up from the frozen ground—excepting when the herbage is buried in snow, and then a small quantity of hay or straw and a few turnips are afforded them. “The Cornwall Agricultural Association” has endeavoured to correct this short-sighted and miscalculating system of privation, by offering premiums for yearling colts and fillies, while at the same time they have enforced on the breeders the necessity of affording shelter and a more liberal supply of food, especially during the first two winters. Daily experience fully proves the impolicy of neglecting young stock of any kind, but such neglect is especially impolitic and injurious in the case of those animals whose value depends on their size, strength, and powers of endurance—qualifications mainly promoted by liberal feeding and careful treatment.

81. *Feeding of Horses.*—This is a very important subject, inasmuch as the maintenance of horses forms a considerable item of the farmer’s expenditure. The general mode is grazing, or soiling, in the summer, and hay, straw, and oats in the winter. The soiling of horses in the summer is getting into practice, it being found the most economical mode; for one acre of grass or clover mowed, and given to the horses in the stable, will go further than double the quantity fed off, independently of its producing an excellent manure.* Tares with rye, sown early in the

* Soiling to a considerable extent has been pursued by Mr. J. Roskrugge of Roskrugge, St. Anthony West. He says: “I kept from the third week in April to the same time in August (1842) 6 horses, 1 colt, 1 bull, 4 working oxen (4 others had their dinners), and 15 pigs, on $4\frac{1}{2}$ acres of Italian rye grass and red clover, and three quarters of an acre of vetches. In 1843 I kept from the 1st of May to the 1st of June 40 head of cattle and horses and 20 pigs, when, from the want of sufficient accommodation, I was obliged to turn part of my stock out; but I continued keeping 7 horses, 2 colts, 6 working oxen, 1 bull, and 20 pigs, until the 2nd of August, on 4 acres of red clover.

“In 1844 I kept from the last week in April to the third week in August, 9 horses, 2 colts, 28 head of cattle, 50 pigs (the youngsters had in addition the wash from the house), on $8\frac{1}{2}$ acres of Italian rye-grass and red clover.

“The quantity of manure I can make by this method of feeding stock is

autumn, produce a large quantity of spring feed, and are cultivated chiefly for this purpose on a great many farms. The introduction of the chaff-cutter has considerably reduced the expense of horse-keep in the winter months: the saving in the item of hay only, by giving chaffed straw and clover instead of an unlimited supply of hay, is immense. The usual proportion of chaff and oats is from 6 lbs. to 8 lbs. of oats to every 20 lbs. of chaff; and 20 lbs. to 30 lbs. of this mixture is sufficient for our agricultural horses, according to size, with fair, or even hard work: the hay in the rick being omitted altogether. Of late the swede turnip has been introduced as food for horses, in conjunction with straw, hay, oats, &c. The following allowance has been used on Barteliver farm in Probus for a number of years—No. 1 used during a scarcity of hay, No. 2 when plentiful:—

No. 1.			No. 2.		
	s.	d.		s.	d.
10 lbs. of chaffed straw, at 20s. per Ton	0	1	16 lbs. of hay (chaffed)	0	6
12 lbs. of oats	0	9½	6 lbs. of oats	0	4½
16 lbs. of swedes	0	1	16 lbs. of swedes	0	1
Expenses of cutting and chaffing	0	0½	Expenses of cutting and chaffing	0	0½
Cost of keep per day	1	0	Cost of keep per day	1	0

A great many farmers find their advantage in steaming swedes as food for horses, and this practice is becoming very common. Steam apparatus of various kinds are manufactured in the county for this purpose. I witnessed a very superior one of this kind on Colonel Scobell's estate in Sancreed. The boiler is 12 feet in length, and 6 feet in diameter; which, at an expenditure only of 8 cwt. of coals per week, supplied, in the winter of 1843, 100 head of fattening and store cattle, 30 horses and colts, and 100 pigs with steamed potatoes and turnips, and chaffed straw and hay, also steamed: all this stock, too, being kept on a farm of 150 acres (70). The fattening pigs are fed on steamed potatoes, with about 12 gallons of barley each. The store pigs get nothing else than the steamed turnips, and the drainage from the steam vats, being the condensed liquid produced after the process of steaming. The advantage derived from this method of feeding horses on cooked food in the winter months is very considerable. I have seen it practised on a great number of farms—the horses sometimes getting scarcely anything else than straw and

immense, being more than sufficient to meet the expense incurred in 'cutting, carting, and feeding.' He adds, "I keep nearly double the quantity of stock that I did before I commenced the 'soiling system,' and in a much better condition. I can also cut a greater quantity of hay per acre, and put more land into tillage; and I am fully persuaded that it is the groundwork of good farming on arable land, and no farmer can make a profit without it."

steamed turnips, a little hay and oats occasionally when hard worked; and although they perspire more freely than those fed in the usual way, yet they look exceedingly well, are particularly sleek and fine in their coats, and appear to do their work as well as horses fed only on hay and oats; and, on the whole, they are less liable to disease.* If there is any truth in Liebig's statement—"that every manifestation of force, however trivial, is accompanied by a change of matter in the body"—it must be evident that there is no inconsiderable saving effected in the wear and tear of the tissues, as well as in the consumption of fat, in feeding animals in this manner. In the cutting of hay and straw into chaff, in the slicing of turnips, and in the bruising of oats and beans, we have examples of economy unwittingly practised by the farmer; and there cannot be a doubt that the cooking of food, for cattle particularly, will be found to effect still further saving.

82. *Pigs*.—The improvement effected in the breed of pigs within the last twenty years is greater than in any other of our domesticated animals. The old Cornish variety was a large, white-coloured, long-sided, heavy-boned, razor-backed animal, that possessed little aptitude to fatten. It is now nearly extinct, and when found is looked on with wonder. The present varieties are crossings of the old breed with the Berkshire, Leicester, Chinese, Neapolitan, and the improved Essex. The black-coloured pigs are preferred, as the skin of this kind does not blister with the heat of the sun, as in the white-coloured breed. They require little other food than vegetables and the wash of the farm-house, except during the fattening, when 24 gallons of barley-meal will suffice to bring them up, at nine months old, to from 350 to 400 lbs.

Animal Labour.

83. *Horse and Ox Teams*.—About forty years since, oxen were regularly worked on road and field, but at present they are

* Farm horses are peculiarly liable to flatulent cholera, inflammation of the bowels, and acute indigestion, which frequently arises from an indiscriminate use of barley-straw, and ill-saved hay. Pneumonia, or inflammation of the substances of the lungs, is seldom met with. This arises from the mean temperature of the climate, being in Cornwall only 8°—that of London is 11°—the effect of which is, that the warmth of summer is never so great as to occasion either a too rapid development or too high an excitement of organized bodies, nor the cold of winter so extreme as to depress the vitality to an injurious degree. On the contrary, tetanic diseases are very common among horses—even the hardy donkey has been known to die of traumatic and idiopathic tetanus in a district bordering on the south channel. This probably arises from the immense oceanic boundary of the Cornish peninsula.

nearly altogether confined to the farm—and their employment there too is gradually decreasing; for although the monotonous chaunt of the plough-boy may still be heard on hill and valley, it is quite as common to see the plough worked by the ploughman and a pair of horses, without a driver. This subject was discussed at the ‘Probus Farmers’ Club,’ a short time since, and the resolution come to on that occasion will embody the present practice on the best managed farms where working-oxen are kept:—“*That for the general purposes of husbandry, horses were preferable to oxen; but that a few pairs of working-oxen on a farm proved extremely useful during the busy seasons, and when no longer wanted should be fattened.*” The farming operations in Cornwall are very liable to be interrupted through the changeableness of our climate, both at seed-time and harvest, so that unusual efforts are oftentimes necessary, and then the ox proves a valuable auxiliary to the horse. The following calculations were made by the club, which caused them to arrive at the above resolutions:—“In harrowing or rolling, a pair of horses will do 8 acres a day, whilst four oxen will scarcely perform more than 6 acres. In ploughing, a pair of horses will do an acre a day (customary acre*), whilst four oxen will scarcely accomplish more than $\frac{2}{3}$ ths of an acre. In carting on the farm only, and that on very hilly ones, four good oxen may be fairly considered equal to a pair of horses. A pair of horses will require a man only to attend them, but four oxen will require the assistance of a boy during four months in the year.” The prices for harness, gear, shoeing, and farriery are based on the amount paid usually under the different heads. The ordinary keep for a pair of horses is charged at 6s. per week each for the summer months, and 7s. per week for the winter months (see Mr. Doble’s method of feeding, 81). The usual method of feeding working-oxen is straw and roots in the winter, and grass in the summer, with an occasional allowance of corn during the busy seasons, either pasturing or soiling. The following are the total expenses incurred in working a pair of horses, valued at 40l. at three years old, for nine years, and selling them with a loss at that period; also the expenses incurred in working three teams of oxen successively during the same time, and selling each team with a profit after three years’ work.

* One hundred acres statute are 84A. Or. 4p. customary. The want of general uniformity in “measures” in Cornwall is so great, that those used in the eastern parts of the county are not known in the western parts. Thus in some places corn is measured by the Winchester—8 gallons to the bushel. In the neighbourhood of Liskeard and Launceston the double Winchester—16 gallons—is used for a bushel; and throughout the whole of the western division the treble Winchester—24 gallons—is employed.

HORSES.			
	£.	s.	d.
Cost-prices of a pair of horses	40	0	0
Keep for 26 winter weeks, at 1s. per week	163	16	0
Keep for 26 summer weeks at 12s. per week	140	8	0
Interest 5 per cent. on cost price	18	0	0
Wear and tear of horses	26	0	0
Gear for pair of horses	5	0	0
Wear and tear of gear	4	10	0
Wages of one man, 1s. 8d. per day	234	0	0
Shoeing a pair of horses, 18s. per annum	8	2	0
Farriery for 9 years, at 15s. per annum	6	15	0
Insurance of pair of horses for 9 years, the average value 33l. 16s. 8d., at 50s. per cent., by the Royal Farmers' Insurance Company	7	10	0
	654	1	0
Deduct, sale of horses at 7l. each, at the termination of 9 years	14	0	0
	640	1	0
Balance in favour of horses about 16l. 6s. 8d. per ann.	147	7	6
	787	8	6

OXEN.			
	£.	s.	d.
Cost price of 4 oxen	36	0	0
Keep of 4 oxen for 9 years, 15l. 1s. 8d. each	543	0	0
Interest 5 per cent. on cost price	16	4	0
Gear for 4 oxen	1	4	0
Wear and tear of gear, at 4s. per annum	1	16	0
Wages of man, at 1s. 8d. per day	234	0	0
Wages of boy, 4 months in the year	21	12	0
Insurance of 12 oxen for 9 years, average value 41l. 13s. 4d., including the improvement, at 30s. per cent.	5	12	6
	859	8	6
Deduct, profit on sale of 3 teams of oxen, at 12l. £.36 0 0			
Deduct first cost on 1 pair	36	0	0
	72	0	0
	787	8	6

Human Labour.

84. The Cornish peasantry are better fed and clothed, and their houses better furnished, than some thirty years since, and there is more appearance of comfort in their families. The wages of the men are about 9s. per week, women 4s., boys from 3s. to 5s., according to age and strength. We have very few allotments in the county, but most of the married labourers have a small plot of garden ground for the cultivation of their vegetables, and in some instances plots for the cultivation of potatoes. The labourers, generally speaking, are an orderly, peaceable, and contented race; and it is a rare instance for a farmer to discharge them when he can afford to keep them. In proof of this, the "Cornwall Agricultural Association" offers every year premiums for agricultural labourers who have lived the longest period in one continuous service; and taking the average of the servitudes for the last fifteen years, they exceed fifty-two years, and the competitors, too, are exceedingly numerous. The following scale will give the average quantity of work considered in the county as a

fair day's labour, and also the prices for various kinds of job-work:—

	Day Work.	Price.
Thrashing wheat by machine . . . . .	. . . . .	1s. 8d. per day
Ditto barley . . . . .	. . . . .	1s. 8d. ditto.
Ditto oats . . . . .	. . . . .	1s. 8d. ditto.
Carting earth with two men and cart	40 loads.	
Mixing manures* (loads all turned back)	40 to 60 do.	
Wheeling manures	240 barrows	
Ploughing for wheat	$\frac{2}{3}$ of an acre.	
Ditto arishes	1 acre.	
Reaping and binding wheat . . . . .	. . . . .	9s. per acre.
Mowing barley and oats . . . . .	. . . . .	3s. 6d. ditto.
Ditto meadow grass . . . . .	. . . . .	4s. ditto.
Ditto clover hay . . . . .	. . . . .	2s. 6d. ditto.
Cutting and binding wood	50 fagots.	
Stone hedging (both sides) per yard, 16 $\frac{1}{2}$ feet . . . . .	. . . . .	3s. 6d. to 5s.
Turf hedging per yard, 16 $\frac{1}{2}$ feet . . . . .	. . . . .	2s.
Hoeing drilled turnips once, per acre . . . . .	. . . . .	6s. to 7s.
Ditto ditto second time, ditto . . . . .	. . . . .	4s. to 5s.
Ditto ditto broadcast, ditto . . . . .	. . . . .	7s. to 10s.
Horse hoeing	3 acres.	
Thatching per square of 9 feet . . . . .	. . . . .	3s. 6d.
For drains 4 feet deep, 2 feet wide at top, and 1 $\frac{1}{2}$ foot wide at bottom, walled with stone and covered with the same material, 18 feet run . . . . .	. . . . .	1s. 4d.
For every foot extra in depth . . . . .	. . . . .	4d. to 6d.

It would be unjust to the labourers of Cornwall were I, in a Report of this kind, not to notice their laudable exertions in the formation of "Friendly Societies," for supporting themselves in cases of sickness, accident, and old age, and at death to afford relief to relations, which are established in most of the agricultural parishes. I select five of these societies to show the system and mode of working.

Names of the Parish or Village.	When established.	No. of Members.	Subscriptions and Donations in 1843.	Amount of Expenditure in 1843.	Capital in the National Debt Office or elsewhere.
Veryan	1837	125	£. s. d. 127 1 4	£. s. d. 89 3 9	£. s. d. 436 0 0
Tresillian	1830	128	81 6 4	43 5 11 $\frac{1}{2}$	350 0 0
St. Stephen's, near Launceston	1807	100	80 0 0	60 0 0	337 0 0
St. Stephen's, East	1785	120	90 0 0	100 0 0	100 0 0
Egloskerry	1830	180	117 0 0	110 0 0	400 0

* The spade is seldom used; but the shovel, a larger and more powerful instrument, is generally adopted,—hence the Cornish labourer seldom exhibits that crippled appearance in the back too frequently observable where the spade is habitual.

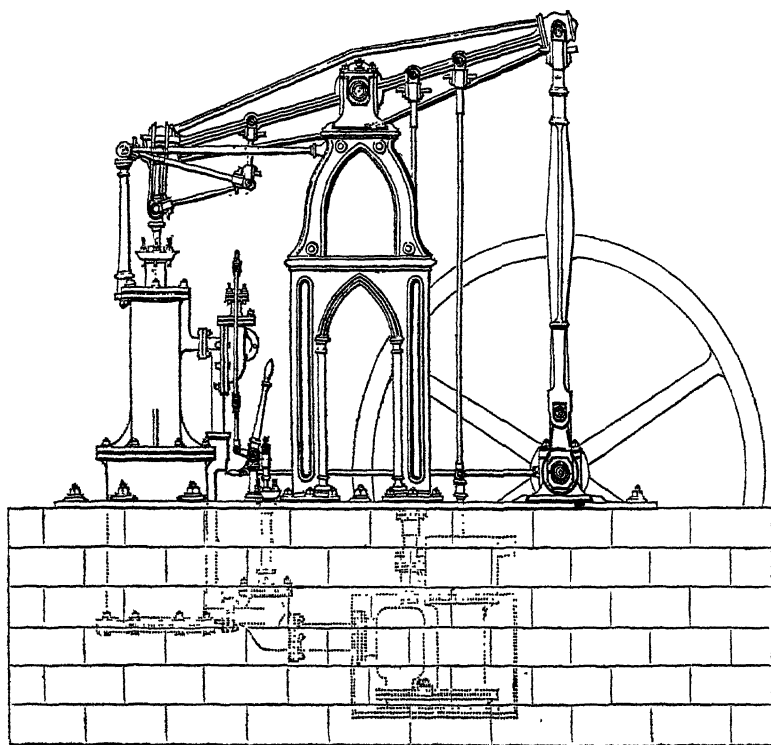
Agricultural Implements.

85. The construction of the agricultural implements generally in Cornwall, within the last few years, is very good—the Cornish being very ingenious in contriving these best suited to their wants, and although not turned out of hand in “Messrs. Ransome’s best style,” many of them may claim the merit of originality, and, in point of usefulness, might compete with those of any county in England. The old lumbering wooden ploughs are fast giving place to iron ones; and the swing-plough, wheel-plough, turn-wrest plough, and skim-coulter ploughs, are now made on the most approved construction, and found on most farms where any pretensions to good husbandry exist. The scarifiers, turnip and manure-drills, turnip-cutters, and horse-hoes, are made on the same principle as those in most repute. Many of our thrashing-machines are exceedingly well made, being built of cast iron, and will thrash 40 bushels of wheat or 60 bushels of barley in an hour. We have a great many thrashing-machines worked by water-power, its advantages over horse power being very considerable, as the motion is more regular, and the work better and more cheaply and quickly done. But it frequently happens that ample water-power cannot be obtained, and in a few instances steam-power has been had recourse to. We have three thrashing-machines worked by steam in our own district; one of them has been worked on Trewithen Farm for the last 30 years. I have given a drawing of a steam-engine of six-horse power, adapted to farming purposes, constructed by Mr. Sims, of Redruth, on his patent improved principle, which is a very great improvement on the common “high pressure engines” in the saving of coals of full 50 per cent.; the expense of fuel not exceeding $2\frac{1}{2}d.$ per hour. The price of one of these engines varies from 180*l.* to 200*l.* In addition to the principal object for which it is intended—thrashing of corn—it can easily be applied to a variety of subordinate purposes, such as the shaking of straw, winnowing and bruising of grain, chaffing of straw, grinding of malt, of oil-cake and rape-cake, and bones; and in addition to all this it can easily be adapted to the steaming of turnips, potatoes, and chaff, by applying the steam from the engine-boiler for this purpose—and thus a complete steaming apparatus for the cooking of food for cattle, horses, and pigs, may be cheaply and easily obtained.

86. The review of Cornish agriculture—its past and present condition, and its future prospects—is thus ended. If there be aught amidst its imperfections on which I may be pardoned for indulging a feeling of conscious satisfaction, it is the fearless, candid opinions and advice I have offered to both landlord and tenant, as

to the best means of improving the soil. To the landlord I have not hesitated to point out the duties which are peculiarly his, in effecting the desired results to which all agricultural operations should tend. He will have seen that his first business will be so to modify the conditions and to extend the term of his tenant's lease, as at once to prevent the pernicious practice of growing two successive white crops, and to induce the tenant by the most powerful of motives—self-interest—to exert his utmost skill, and willingly employ his capital in the cultivation of the soil intrusted to his care. The successful course of permanent improvements in farming can obviously only be maintained by practically convincing the farmer that he will not fail to participate in the results of his well-directed labours. Having, by a judicious and liberal mode of letting his land, implanted this encouraging feeling in the mind of the tenant, the good landlord will next see to the improvement of the farm-yards and buildings. In urging the necessity of so doing, I would guard myself against being considered an advocate of anything approaching to excessive expenditure. I am solely desirous of seeing such a judicious outlay as will enable the farmer to carry on his business in the most economical manner—a matter of vital importance to himself, and obviously tending to give a feeling of satisfaction and confidence to his landlord. To the tenant I would say,—avail yourself of those opportunities which the increasing intelligence of the age offers to all, remembering that, unless you advance with the spirit of progress, by which those around you, in your own and other professions, are directed, you must necessarily go backwards. Casting off the bonds of prejudice and of self-satisfaction, be willing to learn, and to adapt your system of farming to the improved modes of agricultural economy which are based on the union of science and practice. There are not wanting encouragements to you, immediately around and about you. Look to the triumphant results of combined intelligence and experience in the working of our Cornish mines, of the superiority of which Cornish men may rightfully boast against every other mining district in the world. May we not, then, hope for somewhat corresponding results if Cornish intellect and Cornish energy be applied to our agriculture as they have been applied to the extraction of our hidden mineral wealth? I confess I am sanguine in the expectation that such a realization of our best wishes will, ere many years, be effected; for I know well the industry and intelligence of our Cornish farmers—their plain practical sound sense—their frugal and prudent habits—and the anxious desire which is now manifesting itself among them for all kinds of useful information. May I, in conclusion, presume to hope, that my own humble exertions in combining and collating a mass of information from various sources

for their perusal, may not altogether be ineffectual in aiding that onward movement in agriculture which, as it is for the benefit of all classes of society, demands the aid which every member of the community can afford.














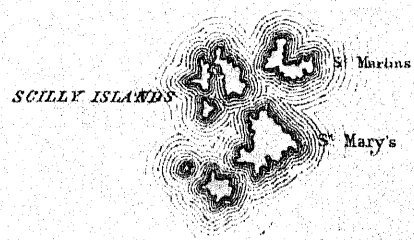
12 0 1 2 3 4 5 ft.

Steam-engine described at page 460.

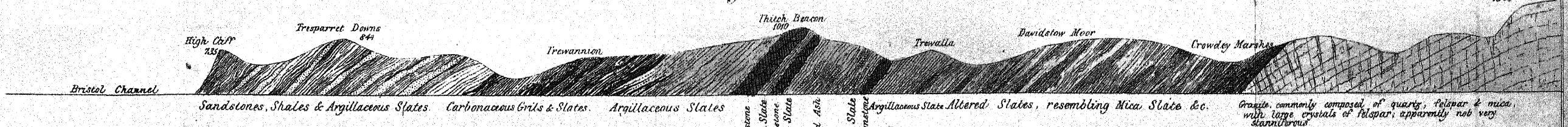
GEOLOGICAL MAP and **SECTIONS** of **CORNWALL**

FROM THE ORDNANCE SURVEY.

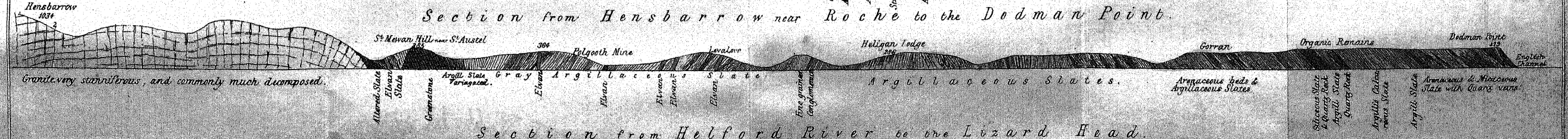
-  Granite
-  Blown Sand
-  Serpentine
-  Carbonaceous Series of Devon & Cornwall
-  Hornblende Rock & Slate
-  Diallage Rock
-  Gneiss
-  Elvan (Granite & Felspar Porphyry)
-  Chlorite Slate & Rock Mica Slate & Gneiss
-  Trappean Rocks associated with Gneiss & Carb Series
-  Limestone in Gneiss



Section from High Cliff near Boscawen to Brown Willy.



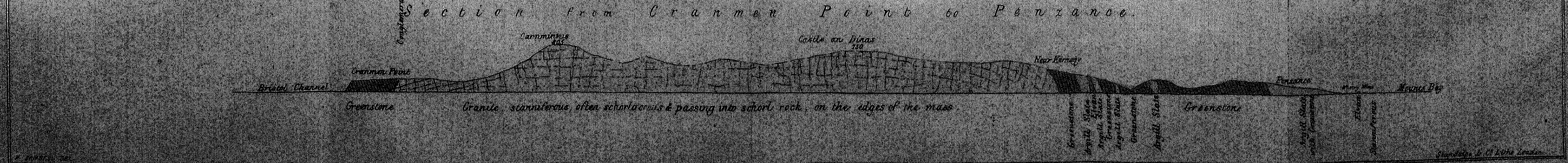
Section from Hensbarrow near Roche to the Dodman Point.



Section from Helford River to the Lizard Head.



Section from Cranman Point to Penzance.



XXXVI.—*On the cheapest and best method of establishing a Tile-Yard.* By FREDERICK WILLIAM ETHEREDGE.

PRIZE ESSAY.

INFORMATION required to be given under the following heads:—

1. *Mode of working the clay according to its quality.*
2. *Machine for making the tiles.*
3. *Sheds for drying the tiles.*
4. *Construction of the kiln.*
5. *Cost of forming the establishment.*
6. *Cost of the tiles when ready for sale.*

Having some considerable experience in the various qualities of clays in England, and also in the preparation of them for brick and tile making, I venture to lay before the Society the following observations, and, deeming all matter not coming under the principal heads given by the Society for elucidation as foreign to the purpose, I shall proceed at once to treat of them in the order in which they stand at the head of this paper.

1. *Mode of working the Clay according to its Quality.*

Since the varieties of clay are so numerous, and each requires in some measure a different mode of treatment, it would be fallacious to pretend that one general rule may be laid down under this head, which would be applicable to all.

All laminated, plastic, and potter's clays, and those free from stones and other impurities, such as are found on the banks of the Tyne; in Flintshire; on the Clee Hills, and at Madely in Shropshire; about Wareham and Poole, in Dorsetshire; in the New Forest in Hampshire; on the banks of the Medway in Kent; and in various other places, may be ranked among the best for drain-tile making. Little difficulty is found in their preparation, as they merely require to be dug in the winter, and thrown up on beds, when they are fit for the pug-mill in the spring.

A peculiar clay occurs near Hexham in Northumberland, almost like a quicksand in nature. It requires no working or winter's frost to improve it, but may at once be dug from the ground, pugged, and moulded, either by machinery or hand, into pipes or tiles of excellent quality. To this may be added all clays lying under peat-bogs, such as are found in South Wales and in various other districts.

Clays, less tenacious and full of small lumps, provincially

termed nubs (not stony), should, early in the winter, be turned up in beds, not exceeding in thickness from 2 to 2½ feet, to receive the frost, which seldom penetrates to a greater depth. The clay thus wintered will be fit for use in the spring and summer following. These are found near the Dover Railway below Tunbridge, in Kent; in Hertfordshire, and elsewhere.

Clays not adhesive, but which become so by working, are found in Northumberland, Warwickshire, Worcestershire, Herefordshire, Derbyshire, Nottinghamshire, Leicestershire, and near Preston in Lancashire. They are generally of a red colour, and marly, full of very small stones, sometimes limewash, provincially termed race, and lie in beds of from 3 to 20 feet deep. They require to be dug in the early winter months, and I recommend crushing rollers to be used for the purpose of equalizing their texture, breaking the stones, and dissevering the race.

This operation of crushing should be performed as the clay is dug, and not, as is usually the case, immediately prior to being converted into tiles. The advantage of this is, that labour is cheaper in winter; your summer boys and men are continued in profitable employment, an advantage obvious to every tile-maker; and, what is of more importance, the clay, being ground, receives the frost better than when thrown up in large blocks or spits. Practical tile-makers are aware that no clay is so fit for use immediately it has passed through the rollers as after it has lain a considerable time. It passes from the crushing rollers (which I recommend in every case to be made movable) into barrows placed under them, and is wheeled on to beds not more than 3 feet thick, as near the tile-machine as possible, and, when watered, is left to receive the frost during the winter. I am aware the usual custom is to throw the clay from its beds on heaps 5 or 6 feet thick; this plan is of little advantage, as the frost seldom penetrates more than from 18 inches to 2 feet, and the nubs or lumps lying below this depth, which are so detrimental to the well working of tile-machines, are not softened or pulverized.

It may be asked hereafter why I do not recommend washing for this kind of clay: my answer is, that for tile-machines generally the stronger the clay is the better. The last-mentioned clay would be weakened instead of becoming more tenacious by washing.

Fire clay is the most difficult of all to manage, and the most expensive; it is found in Staffordshire, Northumberland, South Wales, and in most coal-districts. Some are dissoluble with water, and all with frost. Its want of tenacity, unless proper preparation be used, would disqualify it for making drain-tiles by machinery. The first process is to grind it, either between very close-set iron

rollers, or in a round stone trough with a revolving stone wheel; it is then passed through a hopper into pug-mills, and is there mixed with water until it becomes of a proper consistency for moulding tiles.

I will next mention, under one head, all clays that are improved by washing. Under this head may be enumerated those containing chalk, sand, or stones; those of a very tenacious character, containing limewash (which require lowering), and many others. These are found principally in the eastern parts of Norfolk, in Suffolk, Essex, parts of Huntingdonshire, Lincolnshire, parts of Berkshire, parts of Wiltshire, the Vale of Aylesbury, and in so many other places that it is very important its management should be clearly understood. The best tiles I have ever seen have been made from these clays—they are generally light-coloured, very hard, burn quite straight, and are very sound. Where these clays are found, I recommend to commence digging and washing in November, leaving it in pits, arranged for the purpose, until the beginning of April in the following year. It is then ready for the pug-mill, which is necessary for its perfect amalgamation: for if the pug-mill were not used, it would not be properly mixed and of one consistency, which is absolutely indispensable for making tiles by machinery: little or no waste is found in the manufacture, and I am convinced that all clays of sufficient tenacity, that can be conveniently washed, will produce an article better in quality and at a less cost.

Before treating on the subject of washing, I may remark that allowance must in all cases be made for climate, and the humidity of the atmosphere. For instance, when clay is washed in Northumberland and in Hampshire, many months more must be allowed in the former than in the latter for it to become sufficiently consolidated prior to use—the force of the sun, in the early spring months, being much less in the one than in the other. The subject of washing clay is one which has hitherto been little understood, but its great importance is daily becoming more obvious to those connected with tile-making. In the neighbourhood of London it has been practised many years, but more for the purpose of admixture with chalk for brick-making than for cleansing clay from its various impurities for tile-making. In many parts of England, especially in some of the counties last alluded to, it would be impossible to make tiles without it. It has been argued and set forth by many that washing clay is an expensive and difficult operation. Few things are otherwise, until they are well understood; and I can prove that for tile-making it not only tends to facilitate the working of the various machines, but actually reduces the cost of manufacture. To illustrate this,

I may venture to assert from experience that a tile-maker would contract to make tiles at a less price by washing the clay than if he had to cleanse it from stones by picking and slinging.

The first and most important consideration in the establishment of a wash-mill is a plentiful supply of water, and the next that it should be placed as conveniently as may be to the clay which is intended to be used; and that the wash-pits into which the clay is run should be as contiguous to the machine as possible. The more tenacious clay is, the longer it requires to dry in the pits when washed. As a general rule, I should recommend that the washing be commenced as soon as the season of tile-making is ended, so that the men and boys, as before noticed, who have been employed through the summer, may be continued during the winter; a great object, and one upon which too much stress cannot be laid, is attained by this, over the old system of discharging all the workmen as soon as the season for tile-making is ended. A plan of the wash-mill is given in the drawing (fig. 2), and may be thus described:—A is the mound of earth, raised sufficiently high to give a fall from the clay as it runs from the wash-mill to the pit; B the horse-path; C the circular trough in which the harrows work, 4 feet wide, $2\frac{1}{2}$ deep; D is the centre on which a cart-wheel is fixed, with cross-trees E, to which the harrows F F are attached by a chain; one of the cross-trees extends sufficiently far over the horse-path B for the horse to draw by; H is the plank upon which the clay is wheeled up; K is the trap-door which shuts down whilst the clay is being puddled; L is the grate, with three-sixteenths of an inch opening between each bar; M M the troughs by which the washed earth is carried to the different pits; N the pump, which must be used when the water cannot be naturally run in; O is a receiving-pit, into which the puddled clay first runs, and from which it flows into other pits. The object of this small pit is, that where the clay first falls from the wash-mill there is a considerable formation of sand not fit for tile-making, which is left in this pit by itself, and nothing but pure clay flows into the other pits, P P—the principle being, that the clay from the natural bed should be thrown into the trough, well mixed with water, and broken by the harrows to separate it from the stones, and, when it becomes a thick puddle, be let off through grating by pulling up the trap-door. By this method no stones are allowed to escape into the pits prepared to receive the washed clay below.*

* The tile-machines, both of Mr. Scraggs and Mr. Clayton, screen out the stones from the clay, so that neither pugging nor washing is required, when either of those machines is used.—P. H. PUSEY.

2. Machine for Making the Tiles.

The various machines before the public render it somewhat difficult to detail their several advantages. It must be evident, however, that the preference should be given to that one which unites, in the greatest degree, simplicity of construction with economy of labour. These two points are essentially necessary to constitute a good machine—the former in no less a degree than the latter. When the machinery is complicated, it is constantly subject to derangement, which causes delay, and increases the expense of production.

3. Sheds for Drying the Tiles.

Three descriptions of sheds are shown in the accompanying drawings. I consider the *r* sheds, as shown in Nos. 1 and 2, to be the best for all purposes, and in all districts. They are by far the most economical, and tiles are better and quicker dried under them than in wider sheds. They consist of a single line of posts with side pieces to carry the roof. They may be covered either with tiles, slate, or thatch; but I have found the patent felt manufactured by M'Neil and Co. the most efficient for this purpose, from its cheapness, durability, and at the same time requiring a much lighter roof to the sheds than any other covering.

In plan No. 1, I have shown a much larger shed *r*, and a shed for the machine *w*, which in very extensive establishments is necessary as well as smaller ones, so that no time may be lost in wet weather; the tiles, as soon as made, being wheeled into the large shed without going into the open air. The centre rows of tiles in these sheds do not dry so quickly as in smaller sheds, as there is no free current of air, and consequently, were they generally adopted in a yard, a much larger area of shed-room would be required. I am aware there are some few descriptions of clays used for tile-making, which, when made into tiles, would crack if exposed in narrow sheds to a quick draught. In such cases the large sheds must be adopted with shutters, or canvas rolls at the sides to protect the outside rows of tiles, or the waste from spoiled tiles would be about 25 per cent.

In drawing No. 3 the sheds are intended for the most economical system, and for smaller estates or tenant farmers, who only require from 50,000 to 100,000 tiles per annum for their own use, and who would find it much cheaper to make tiles at home than to cart them any distance, and would at the same time save the maker's profit. These sheds are found very useful in large works for brick hakes, or when at any time an additional quantity of tiles may be required, the cost being little more than the straw of

which the covering *x* is made. A new kind of shed is adopted in Scotland at some tile-works. Each shed, about 12 feet long, 4 feet wide, and 6 feet high, is made movable on wooden or iron rails, which are so laid that the sheds may be pushed close up to the machine, and, when filled, be left to dry, and wheeled on to the kilns without the tiles being moved. Several advantages arise from this; there is not so much breakage, and something is saved in the cost of manufacture.

Tiles made singly require shelving to keep them straight, which increases the outlay in buildings very considerably, but is necessarily adopted when many of the various machines are used.

4. Construction of the Kiln.

The variety of kilns renders it no easy matter to advise on the cheapest, and, at the same time, the best, their excellence being determined by the smallest consumption of fuel, with due regard to the quality of the article produced.

I prefer them so constructed as to hold about 30,000 to 40,000 of tiles 3 in. by 2 in.

The kiln in plan 3, as shown upon the drawing, is not so good in principle as those in plans Nos. 1 and 2, as it consumes more fuel per 1000 than the others, but it is much the cheapest, and, if properly built, will last many years.

I will shortly describe the three. No. 1 is a double kiln, each kiln being 12 feet 6 in. by 11 feet, inside; built of bricks (or of Norfolk clay lumps,* lined with brick as being much cheaper),

* Norfolk clay lumps are made in the manner here described:—Clay, dug from a pit, is mixed with as much sand as it will carry to remain tenacious, say 1 yard of clay to half a ton of sand; sometimes a small quantity of straw is thrown in, the whole trodden by a horse until it becomes of one consistency, when it is thrown into moulds, or wooden boxes made very strong, 18 inches long, 12 inches wide, and 7 inches deep. When removed from the box they are left to harden partially, and are turned constantly on their ends and sides so as to dry straight, and when nearly dry, are piled in stacks until required for use. These lumps are always made on the spot where they are used, on account of the expense of carriage.

The box or mould is made of deal, 2½ inches thick, and well bound round the corners with hoop-iron; the bottom and top edges are also cased with iron, to prevent them wearing.

In Norfolk, Suffolk, and Essex, these are made at from 5s. to 7s. per 100. Walls are built at 10d. and 1s. per yard square (or 9 feet), 1 foot thick, including the pinning and foundation.

Cottages, houses, and farm buildings are generally built of this material in the above-named counties, especially in the clay districts, and they are not liable to brick-duty.

and being protected by banks on three sides, and the burner's shed on the fourth, is not subject to injury from the weather. When the situation will permit (as in nine times out of ten it will), it is much the best plan to sink the kiln underground. The drawings show the kilns 7 feet underground and 9 feet above. The three outside walls built of brick must be 18 inches thick; the centre wall, 2 feet thick, between the kilns. If the kiln be built of stone, it will require a $4\frac{1}{2}$ inch lining of brick thoroughly tied into the stone-work; the stone wall being 20 inches thick.

If built of Norfolk lumps, or what is termed in Devonshire *cobb*, it must be lined with brick in the same way, and the clay wall made 30 inches thick; *B B* shows the head wall, in which are two openings or hatchways, *C C*, 3 feet wide, open to the top of the kiln, and below the ground ten fire-holes, 3 feet by 1, arched at the top and at equal distances, commencing at 9 inches from the internal side of the kiln, and having 18 inches between each, thus making a total of 12 feet 6 inches.

The fire-holes are enclosed by doors *D D*, 18 inches by 12 inches, and the under 18 inches are for draught, and left open to scrape out the cinders.

The head wall is built 3 feet 6 inches thick, 4 feet high from the foundation, to prevent, if possible, the waste of any tiles from too rapid burning; above this height it gradually decreases in thickness to the top, which is the same as *A A*. The bearing bars may be of wrought-iron, 18 inches long, $2\frac{1}{2}$ inches by $\frac{1}{2}$ inch, which are firmly fixed 2 feet 6 inches apart in the fire-holes, 18 inches from the bottom, which allows a clear area of 18 inches by 12 inches for the draught and cinder holes. These draught-holes will extend from the head to the opposite wall, entirely through the kiln. On the bearers are placed the long bars of wrought-iron, 14 feet 3 inches long, $2\frac{1}{2}$ inches by $\frac{1}{2}$ inch, four in each fire-hole, with a nail between each to prevent them from melting together. I may here remark that bars of wrought-iron* answer better than those of cast-iron, and are far cheaper. The benches are built 18 inches thick between each fire-hole the whole length of the kiln, and are carried up 2 feet 6 inches, which is the height of the rise

* Wrought-iron bars do not cost one-third the price of cast-iron, in consequence of the immense weight of the latter. They are found to last quite as long; and in case of their becoming burnt up, each bar being the whole length of the fire-hole, a new one is easily substituted without disturbing the rest. The time that bars last entirely depends on the fireman; I have seen both kinds nearly destroyed in two seasons from neglect—wrought iron will generally last 10 or 12 years.

of the arch in the head wall. From this point the bricks are overlapped in the courses, but with a space of $2\frac{1}{2}$ inches between each row, to allow the fire to ascend, so that in four courses the bricks meet in the centre of the fire-hole, and the bottom of the kiln presents an even surface with longitudinal openings, $2\frac{1}{2}$ inches wide from side to side. On the top of this it is necessary to lay bricks one deep edgeways, to raise the tiles a little, so that the flame may not catch the tiles too soon; these bricks are placed laterally across the longitudinal openings. The whole bottom then presents an even surface, full of pigeon-holes 6 inches by $2\frac{3}{4}$ inches, upon which the tiles may be at once placed, and if properly burnt, little or no loss is sustained. The kiln-pit, or hopper, $\kappa \kappa$, is 27 feet by 13 feet 6 inches, partly covered by a roof, abutting against the head wall; it requires to be large to allow the burner room to use the irons for the fires. The roof covers 8 feet in width, and rises from the ground to the head wall 4 feet 6 inches above the level of the ground; it is covered with patent felt, and has two openings in it or gangways to the hatchways: the remainder of the kiln-pit is open for coals. Planks $o o$ are laid across the kiln-pit to the hatchway, to wheel on: p is the kiln roof, running on four wheels on a rail, to cover the tiles while the one kiln is being set, and while burning is run over the other kiln, which, though not much used at present, is one of the great improvements in the construction of kilns; it is covered with felt: π is an embankment of earth round three of the sides of the kiln, 6 feet wide at the base, and rising up to within 1 foot of the top of the kiln. It entirely keeps out the winds that often destroy a portion of the goods, the fireman or burner not being able to guide his fires universally over the kiln, it also tends much to strengthen the walls.

The single kiln, in drawing No. 2, does not differ materially from No. 1, excepting in the inside construction; the difference consisting in the bearing and other bars, which, instead of running the whole length of the fire-holes as in No. 1, only extend the thickness of the head wall 3 feet 6 inches; the rest of the fire-hole being left perfectly open, these short bars are laid a little on the incline towards the inside. The benches, instead of being carried up and finished with overlapping bricks as in plan 1, are only built up 18 inches high, and from this height unburnt bricks are set, according to the fancy of the burner, and drawn when burnt. Some persons imagine these bricks, say 4000 in each kiln, are burnt without any additional expense, but this is a mistake, as bricks, being more solid, require more fuel to burn them than tiles, and a longer number of hours; and I have seldom seen any good ones burnt in the bottom of a kiln of this description. I

mention these points to advise those who build kilns on the principle of plan No. 2, to put in a bottom, or to leave the first bricks burnt next the benches, for the season.

The kiln, in drawing No. 3, is the most simple and inexpensive—it is built, as shown, entirely of Norfolk lumps—the walls are 3 feet thick. This kiln has two sets of fire-holes opposite each other for fires on both sides; they are the same distance apart, as in plan No. 1. No bars are used, the fires being made on the ground. Benches are made of green bricks, and there is no necessity to remove them; when burnt they may remain, and nothing but tiles need afterwards be burnt. I introduce it under an idea that it is suitable for small properties and tenant farmers, as it is cheap, but certainly not so economical for burning tiles as the plan No. 1.

Many kilns in the eastern counties are constructed with only one fire-hole under them, 4 feet in diameter, either circular or oval; but my opinion is, that the greater the number of fire-holes the less is the amount of waste, and the less the consumption of fuel. I give a proof of this in a double kiln built of Norfolk clay lumps, one having four fire-holes, the other three, of exactly the same size, to hold 36,000; the kiln with three holes always consumed from $\frac{1}{2}$ to $\frac{3}{4}$ of a ton more fuel than the other. Before concluding the subject of kilns, I must remark that in some places wood is used instead of coals; it is not so cheap, but makes better goods: where wood is used the only alterations in the kilns are, that no bars are required, and the fire-holes, instead of being 12 inches, are 2 feet wide, but of the same height (2 feet 6 inches) as in the other plans.

5. On the Cost of forming an Establishment.

I shall give the cost of the three shown in the plan, *exclusive of timber.*

Plan No. 1.

*Double kiln, 12 feet 6 inches by 11 feet,
walls 18 inches thick, head wall 3 feet
thick, centre wall 2 feet thick.*

	£.	s.	d.
45,000 bricks at 21s. per 1000	47	5	0
6000 bricks for dead bottom	6	6	0
Furnace-bars	20	0	0
Carried forward	73	11	0

	£.	s.	d.	£.	s.	d.
Brought forward	73	11	0			
10 doors and frames	7	0	0			
Set of kiln-irons	1	10	0			
Digging kiln-pit 120 cubic yards	3	0	0			
Labour and building, mortar, &c.	25	0	0			
				110	1	0

Hopper or burning shed, with roof 8 feet,
the remainder open for coal-house, size
of whole 14 feet 6 inches by 27 feet.

Digging pit 100 cubic yards	2	10	0			
5000 bricks	5	5	0			
1800 bricks for floor	1	18	0			
280 feet patent felt	1	4	0			
Labour	4	0	0			
Timber, 2 posts 10-feet long, 54 feet wall-plate, 18 rafters	0	0	0			
				14	17	0

Kiln-roof to run on four wheels from
one kiln to the other.

6 iron wheels 8 inches high	0	12	0			
Workmanship and nails	2	10	0			
Patent felt, 200 feet at 1d.	0	16	4			
Wooden rails	0	0	0			
				3	18	4

Sheds: one 50 feet long by 18 feet wide,
six 50 feet long by 4 feet wide.

30 posts 6 feet 6 inches long, 10 posts 10 feet long, 100 feet wall-plate, 72 rafters, 434 short rafters for r roofs	0	0	0			
Patent felt for roof	11	2	0			
Workmanship and nails	9	0	0			
Preparation of ground	1	5	0			
Fixing and joining felt	2	10	0			
				23	17	0

Barrows: 3 navys, 6 offbearers, 4 crowders	5	4	0			
Stage for machine	1	0	0			
Carriage of machine and fixing	4	0	0			
Digging well and pump	5	0	0			
Wood for planks	3	12	0			
Incidentals	20	17	0			

Total £192 6 4

Tile-Yard, Plan No. 2.

	£.	s.	d.	£.	s.	d.
Single kiln, 12 feet 6 inches by 10 feet ; 7 feet underground, 9 feet above.						
27,100 bricks at 21s.*	28	7	0			
3000 bricks for dead bottom	3	3	0			
Brought forward	31	10	0			
Set of kiln-irons	1	6	0			
5 cast-iron doors and frames	3	0	0			
Bars for kiln	2	10	0			
Digging pit, labour, and mortar	8	12	0			
				46	18	0
Sheds : four 50 feet x sheds, 4 feet wide, to contain 20,000 tiles or 40,000 inch- pipes.						
24 posts 7 feet long, 400 rafters, 400 feet wall-plate	0	0	0			
Workmanship and nails	3	10	0			
134 yards of patent felt	4	10	0			
				8	0	0
Barrows : 2 navys, 3 crowders, 3 off- bearers				3	4	0
Carriage of machine, planks, and incidentals				19	16	0
				£77	18	0
Hopper for kiln if required				7	10	0
Total				£85	8	0

* Price of Clamp-Bricks for building a Kiln, per 1000 :—

	£.	s.	d.
Digging 2½ yards of clay, at 6d. per yard	0	1	3
Pugging and mixing with ashes, as used	0	1	3
Moulding and hacking	0	4	6
Opening (or skinkling) holes for drying	0	0	6
Clamping	0	1	6
Coals, or culm	0	2	6
Stacking	0	1	0
Duty	0	6	0
Ashes	0	1	0
Waste, &c.	0	1	6
	£1	1	0

Tile-Yard, Plan No. 3.

	£.	s.	d.	£.	s.	d.
Kiln 12 feet 6 inches by 10 feet; 7 feet underground, 8 feet above, with fire-holes on two sides.						
2360 clay lumps 18 inches long, 12 inches wide, and 9 inches thick, including workmanship and labour of building walls 3 feet thick, stone foundation rising 10 inches, at 10 <i>d.</i> per yard, 1 foot thick	12	6	0			
2000 bricks for arches	2	2	0			
650 bricks for wall coping	0	12	0			
Sinking kiln-pit	0	10	0			
Coal-tar and labour on ditto	1	5	0			
Kiln-irons	1	6	0			
Putting up wooden brace	1	0	0			
				19	1	0
Sheds: four 50 feet thatched sheds 4 feet wide, to contain the same number as in plan No. 2.						
32 small posts and wall-plate	0	0	0			
20 wooden frames for thatch	0	0	0			
Labour, carpenter, &c.	3	10	0			
				3	10	0
Barrows: 2 navys, 3 offbearers, 3 crowders				3	4	0
Carriage and putting-up machine				3	10	0
Incidentals				14	15	0
Total	£44	0	0			

Straw not calculated.

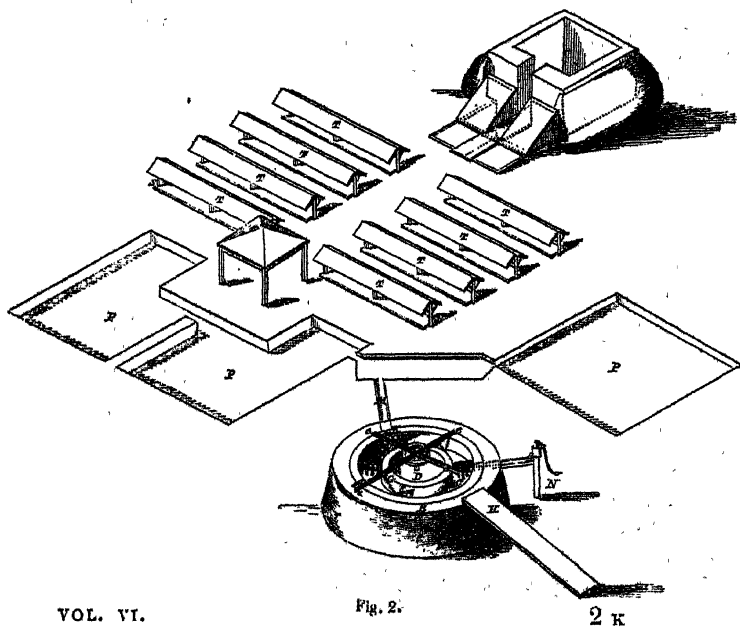
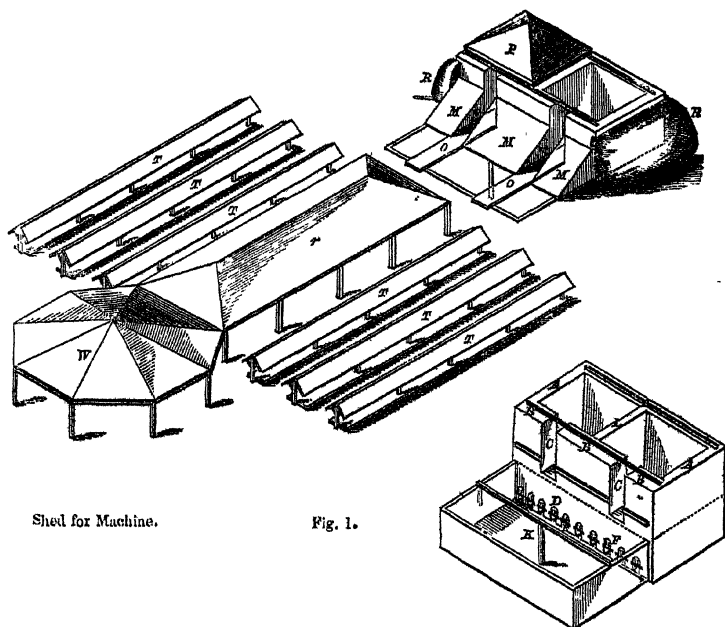
The Cost of a Wash Mill.

	£.	s.	d.
3000 bricks to make trough	3	3	0
4 harrows and chains complete	4	4	0
Workmanship and cart-wheel for centre, fitted with iron box and cross-trees to attach harrows	5	12	0
Making mound on which to place machine so as to allow a fall for the clay to the pits	7	1	0
	£20	0	0

When the mill can be placed on the slope of a hill most of the last item is saved.

6. On the Cost of Tiles when ready for Sale.

This is the most difficult question to answer, as no general rule can be laid down. I know a tile-yard in Norfolk where the clay is blue, full of chalk and stones, which is washed to free it from these impurities; the contract price is 9*s.* 6*d.* per 1000, including



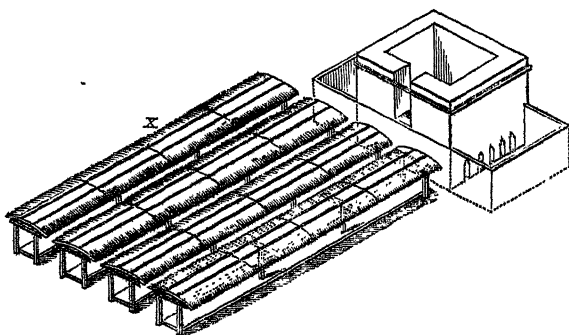


Fig. 3.

every expense; the tiles are 15 inches long, made with a flange: price of coals 24s. per ton. These tiles are sold at 16s. per 1000; and the soles, of the same length, at 10s. per 1000. These are made by Etheredge's machine.

Mr. Parkes states that pipes made by Clayton's machines, of inch bore, are sold at Yarmouth, Isle of Wight, at 12s.* per 1000, 12 inches long; pipes $2\frac{1}{2}$ inches bore, at 18s. per 1000, 12 inches long; coals about 20s. per ton.

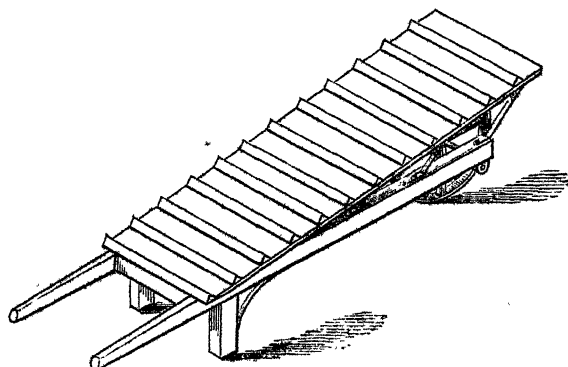
Mr. Hodges states that pipes 1 inch bore, 12 inches long, made by Hatcher's machine at Benenden, Kent, are sold at 12s. per 1000; $2\frac{1}{2}$ inches bore, 12 inches long, at 20s. per 1000; coals at 24s. per ton.

The great difference in the price of tiles arises from good or bad management. I know two yards, one in Worcestershire, the other in Herefordshire, where there is a difference of 11s. per 1000 in the cost of producing the same sized tiles; coals the same price at both yards, and both using the same machine. If a machine of any kind will make cheap and good tiles at one tile-yard, it will at another. The great evil is that the inventors of the machines do not make it imperative on purchasers to allow them to send a man to start them properly, for if the slightest difficulty is found by the workmen the machines are condemned (as they are generally prejudiced against improvements) with only a few hours' trial.

Every one must be aware that, although so many hands are not *now* employed to produce a given number of tiles as formerly, instead of there being one tile-yard in a district there are now five. Yet I believe that the most difficult point consequently is to find useful men to take the management of the numerous small works established; and that, although machinery has reduced the price of the article, it has not been the means of throwing out of employment a single hand, but that it has created not only labour

* 10s. is the price I pay for inch pipes, with coals at 20s.—*PH. PUSEY.*

for the poor by an immense increase in the consumption of tiles, but also a greater amount of produce for the farmer: the landed proprietor is also enabled to drain his land at a cost far below that at which he would have done it with hand-made tiles.



Barrow.

XXXVII.—*Effect of Burnt Clay on a Crop of Wheat, growing upon very heavy Clay Land.* By PH. PUSEY, M.P.

SEVERAL accounts of the good effect of burnt clay as a manure have appeared in the Journal: having used it with success, I am induced to add my own testimony in its favour, chiefly on account of the very bad quality of the land on which it succeeded. It is a farm of about 500 acres, which I bought seven years since, on the Oxford clay, of the very stiffest description, never ploughed with less than four, sometimes with five or even six horses. The soil was like bird-lime in wet weather, and in dry summers like stone, requiring a pickaxe to break it. Many of the fields might be described as being all subsoil, there being no real mould on the surface. The average yield of wheat did not exceed 16 bushels an acre, and on some fields the thistles were more numerous than the stalks of wheat. It had the worst possible character, so that even in 1839, when prices were good, many farmers who looked at the farm declined to occupy it, and I had great difficulty in finding a tenant at all. Having bought the farm, however, chiefly because it is the most difficult sort of land to manage (said, indeed, to defy improvement), in order to try what could be made of it, as Lord Ducie and Mr. Morton have done at Whitfield with so much success, I underdrained the whole, in the first instance at 10 feet apart, but now at 30 feet apart, and 34 inches in depth.

In order to make the land work more easily, I procured from Essex some labourers conversant with the mode of burning clay which is there practised. Into the details of that process I need not enter, as excellent accounts of it have been given in this Journal by Mr. Pym (vol. iii. p. 323) and by Mr. Randell (vol. v. p. 113). I burnt large quantities for the tenant, but until last year no record of the effect had been kept, when, seeing him apply it to a small wheat-field of eight acres, I begged him to omit the burnt clay on one corner of the field, that we might know whether it was worth while to burn any more clay. Mr. Cheer did so accordingly. The crop was a very fine one; and after harvest he threshed out about one-eighth of an acre separately. He found the result as follows:—

One Acre.	Wheat.
No manure	37 $\frac{1}{2}$ bushels.
80 yards burnt clay	45 $\frac{1}{2}$ „
80 yards ditto, and sheep-folded	47 $\frac{1}{2}$ „

It will be remarked that this is not a garden experiment, but applies to a whole field of wheat, and that the account was given in by the occupier of the land. Now I have lying before me the valuation at which I bought this identical field, one of the worst on the farm. It is 10s. an acre for rent, or 14*l.* for the fee-simple. Thorough-draining with thorns, at 10 feet asunder, cost about 3*l.* 10s. It could now be done with pipes for 2*l.* Dressing with 80 bushels of burnt clay cost about 2*l.* 5s. The crop must have been worth this year about 17*l.*, or nearly the fee-simple of the land and the cost of the improvements. It will be observed that on a third lot the land was dressed with sheep-folding, in addition to the burnt clay, but that the increase of yield was trifling. The manure, in fact, was more than the crop would bear, and the wheat was consequently laid by the wet summer. This is a conclusive proof that the burnt clay, in this instance, acted as a manure, and not merely mechanically. I do not mean that burnt clay will always act as a manure, indeed I know that it sometimes fails to do so, and there is yet much to learn on the subject; but this case of success being beyond suspicion of accident, I have thought it right to detail the circumstances of the trial, as an encouragement to the owners and tenants of the worst and most expensive kind of heavy land, which I believe to be the Oxford clay, where it is not covered with soil of a different quality. This farm at Longworth is that on which the trial of the ploughs reserved from Shrewsbury took place last autumn; and Mr. Parkes, in his Report on the implements, bears witness to its obstinate nature.

Pusey, Jan. 7, 1846.

XXXVIII.—*On the Necessity for Reducing the Size and Number of Hedges.* By J. H. TURNER.

THE Royal Agricultural Society of England having offered a prize for the best essay upon fences, I proceed to respond to the call of the Society, and in so doing I will endeavour to confine myself as closely as possible to the different points which the Society has called upon competitors to describe.

Firstly.—"The best and neatest method of maintaining hedges, whether for arable or grazing ground." *Hedges for arable ground.*—I will not here enter upon the general question, how far all hedges upon arable land, in the hands of the same occupier, in the same farm, should be done away with; but I will take it for granted that there must ever be some cases where hedges between arable fields must be necessary, viz., in divisions of property or of occupation. In these situations, it appears to me that the desired object is to maintain a hedge which shall occupy as little space as possible, and which shall allow of the field being cultivated very closely to the stem of the hedge. I think that no fence will answer this purpose so well (provided it can be raised upon the soil) as one of quickset. Quickset hedges, where properly managed, and where care is taken in their raising and clipping, or brushing, are, between arable fields, by far the most desirable fences, and the following plan of raising and managing these hedges is practised in some districts with the most perfect success. The best and strongest plants are obtained that the farmer can purchase, and the land being properly prepared for their reception, they are planted as closely together as possible: half or three-quarters of an inch apart is not too close. They are carefully weeded till they attain three years' growth; the hedge is then cut down to one uniform height, about 2 feet, some of the strongest plants being plashed down in a transverse direction, which causes the hedge to grow thick and bushy. They are then left to grow until they attain the height of 4 feet, or a few inches more, and from that time they are carefully brushed, or clipped, twice a year—once in June, and once in August or September. Care must be taken in so doing to prevent the hedge from growing higher, or increasing too greatly in width, which should never exceed more than 6 or 8 inches, or at the very most 10 inches, although in some cases where quickset hedges have been raised they have been suffered to attain a width in the centre of 18 or 20 inches, and have also grown very full and bushy at the bottom.

The advantages of this description of fence are the following. In the first place, the small portion of space which they occupy, and consequently subtract from the adjoining fields. I have seen

in Mid-Kent (where the plan of quickset hedges is carried out in a most excellent manner) the land cultivated completely up to the stem of the hedge, and no more soil taken from the operation of the plough than is barely sufficient for the hedge to stand upon. Again: when such a hedge is once raised, there is no re-making required, and these fences are not so liable to have gaps made in them as others, both from the thorny nature of the materials of which they are constructed and the height at which they are kept. They are also calculated in an eminent degree, by reason of their total freedom from any description of timber, to give the adjoining land the benefits of a free circulation of sun and air.

But there are situations or circumstances in which it may not be easy to raise quickset fences, and where there are at present hedges existing between arable fields, composed of hazel, and white and black thorn, and other brushwood, very frequently of considerable breadth—from 10 to 20 feet—taking away a great portion of valuable soil, and growing nothing but rubbishy and worse than useless underwood, affording a covert for game; and raising an amount of hedgerow-timber which proves in the highest degree injurious to the adjoining fields.

Having dealt with similar cases to the above from personal experience, and with very considerable success, I may perhaps be permitted to detail the plans which were there carried out, and the results which have followed from their adoption.

The principal portion of the timber having been cut down by the landlord, the underwood was cut, and the roots grubbed completely up to the stem of the outside hedge (I use the word *hedge* in its strictly legitimate sense), which was divided by a small ditch, or watercourse, from the adjoining fields. The live stuff of the hedge was then thickly plashed down together, and suffered to remain without cutting for the first year or two, and since that time has been regularly brushed every year in July or August, and they are now for the most part good live hedges, form a sufficient fence between the fields, and possess all the advantages which I have before attributed to quickset, though of course in a lesser degree. I have also kept a hedge (which was of a thorny kind) made in the ordinary manner practised in the south of England, with stakes and binders cut in the above method, and the result has been equally satisfactory. I do not consider it advisable to let such hedges as I recommend reach a greater height than 3 feet 6 inches. In one of the instances narrated above, in a field of 14 acres, the side fences of which were treated as I have described, more than half an acre of ground has been reclaimed, and in every case the fresh soil acquired has been considerable, and, together with the roots of the underwood, has

amply repaid the trouble and expense. The land acquired was the first year planted with potatoes, and since that time has been cultivated with the rest of the field. I do not think it will be necessary to go further into this part of the subject, except to remark, that if any farmer who may be similarly circumstanced can prevail upon his landlord to cut down the hedgerow timber, and will then set to work to reduce his fences within proper dimensions, in the manner I have described above, I feel certain he will be amply rewarded for his outlay in every shape, and will confer a great benefit upon his landlord's property as well.

Secondly.—"Hedges for grazing-ground." I do not think there are any fences which answer so well for this purpose upon sound dry land as quickset hedges. Let them be raised and managed in the manner I have recommended for arable fields, except that these hedges for grazing land should be suffered to grow 8 or 10 inches thicker, and 6 inches higher, than those for arable fields, as the cattle will not then be so liable to do them injury in feeding upon the young shoots.

Upon wet grazing lands, or those subject to be flooded in winter, without entering into the question of ditches, which I conceive to be foreign to the subject of this essay, I may be allowed to remark, that hedges of willow or osier in some situations answer well: they may be planted upon an embankment raised by throwing out ditches on each side, of a depth and width which must be regulated according to the probable draught of water they will be required to carry off. From the dampness of the situation the willows soon take root, and grow rapidly, affording an excellent shelter to the cattle from the wind and rough weather. The willow will require cutting once in eight or nine years, and will be found available for many useful purposes: in this neighbourhood they are principally used for hop-poles. In very exposed situations in levels or marshes, large belts of fir and willow plantations may be tried, and will be found to make a very satisfactory protection for the cattle feeding on these levels. Of course there are levels and marshes lying contiguous to the sea, to which these plans are not at all applicable, and for which large open ditches and sluices are the only divisions that can be used with effect.

I will now proceed to discuss the second part of the subject—"How far the present fences in various parts of England are injurious to the farmer, whether by their size, their excess in number, or the overabundance of timber which they contain."

I do not think that any person will be found to deny that the fences in many parts of England are *injurious* to the farmers, and that they are so by reason of those very facts which the Society have adduced. But before enlarging upon these points, I must

advert to the general question, how far all fences between arable fields should be destroyed. My own feeling is in accordance with that which Mr. Pusey, in a number of this Journal, has mentioned that his tenants have remarked to him, namely, "that they do not require more than one arable field on a farm." I would, of course, restrict this opinion to land lying tolerably compact and square, of an even character. The reasons which have led me to this conclusion are the following: 1st. The very considerable amount of cultivated land which would be added to a farm by destroying the hedges. I feel confident that in the average of farms in this district, 1 acre in 10 would be added to the cultivated land by the entire extinction of fences. The second reason, and many tenant-farmers would say the first, is, that any covert for game in the shape of hedge-rows would be totally destroyed; but this being rather irrelevant to the reasons the Society have put forth, I will not further allude to this point. The third reason is, that the farmer would be enabled to divide his land into distinct pieces of a similar size, for the purpose of a systematic rotation of crops. We will suppose a farm of 400 acres of arable land, cultivated upon the Norfolk or four-course system of husbandry, and here the advantages of having four 100-acre pieces of wheat, turnips, barley, and clover, will be clearly apparent. In feeding off the green crops with sheep, folding might be regularly continued throughout that separate crop, until it were concluded; there would be no driving of sheep from field to field, or carriage of hurdles and crops, and other inconveniences, which, though small individually, yet form in the whole a considerable amount of labour. Again, the time which would be saved in ploughing, &c., and the benefits which would result from being enabled to dispense with the many headlands which take away so much from small fields, are very considerable items in the amount of saving which would be effected. Again, in sowing, reaping, harrowing, and rolling of corn, and in the carting of corn, hay, and manure, there would be great and tangible benefits resulting from being enabled to pursue each of these branches of agricultural operations, and keeping steadily working at them, upon the same tract of land, until the whole of that branch were completed. I am aware, that with the large farmers on the Border, in Northumberland, Roxburghshire, and Berwickshire, I should find many opponents to this system; they, being in the habit of pasturing their sheep and beasts together in the same fields, and never, except in the feeding off turnips, resorting to the practice of folding their sheep, would declare the plan to be unwise and inexpedient. But without discussing the question how far their plan is the preferable one (I am strongly of opinion it is not so), I am convinced that the plan of no fences

to arable land can be well carried out, and is capable of being carried out in a better manner than it is now. It is well known that in hill-farms and some other situations in many districts of the kingdom, the plan is really carried out in its fullest extent, and with great success. Undoubtedly, if generally adopted, it would involve the strictest rules of folding and soiling; and I admit that it carries this point with it to me as one of its strongest recommendations; for were folding universally, and soiling generally, practised, there can be little doubt indeed that the character of farming would be raised; and I do not think I can more forcibly show the advantages the one-field system possesses over that of small divisions, than by putting the one in comparison with the other. I will then suppose a farm of 400 acres of arable land lying in one field, and one of a similar extent of acres divided into forty fields of 10 acres each, say even by the very best managed quickset hedges. I do not think I am over-stating the question when I assume 10 acres to be a fair size for enclosed fields, some farms of course having the fields larger, and some (these are the majority in this neighbourhood) have them smaller. I will still presume the farmer to crop his land upon the four-course system, and to have an equal division of wheat, turnips, barley, and clover, and I do not hesitate in saying that the farmer would be enabled to plough his land upon the 100 acres in two days less each time of ploughing than the farmer in the small divisions could do. The same reasoning will apply to harrowing, scarifying, sowing, mowing, and carrying of corn and hay, though of course in a lesser degree. Again, in folding sheep, I have before remarked, the one-field system presents a decided superiority, and there are many other hindrances attaching themselves to the small-field system, from which the farmer on the other scale would be totally exempt; in short, in every respect, from the first moment of breaking up the wheat-stubble for turnips, until the last ploughing of the clover-lay for wheat again, there would be throughout, in every succeeding branch of agricultural operations, a clear and palpable advantage in favour of the one-field system. There are other benefits still to be enumerated; but as I must discuss them under the heads of the disadvantages which the Society have put forth, I will forbear alluding to them at present. There can be no doubt but that any approximation to the system is far better than the plan of small fields; and that fields of 40, 50, or 100 acres each, would be unquestionably more advantageous than those of 5 or 10 acres; but still the reasons I have before stated give, though of course in a lesser degree, the preference to the *one-field system*.

I will now proceed to discuss the remaining points given by the Society: the injury these fences cause "by their size, their

excess in number, and the over-abundance of timber which they contain."

First, They are injurious to the farmer by reason of their *size*. In many parts of the kingdom, and especially in some enclosed districts in the southern counties, this is a very prominent evil. I have no doubt, as I have remarked before, that one acre in ten is often subtracted from the cultivated land on a farm, by reason of the size of the hedge. These being for the most part of the class I have above described, and composed of black-thorn, hazel, and rough underwood, with brambles and other rubbish growing at their roots, are continually encroaching on the fields; the rough grass and rubbish also grow out upon the headland, and frequently cause that to grow but very little corn, &c. This to the farmer, who is anxious to keep his land in a good and clean state of cultivation, is a very serious injury. Again, these very large fences are generally very full of hedgerow timber; and although this comes under a distinct head, I may yet here remark, that large fences are, from their size and thickness, more liable to give protection to the young ash or oak tellow, until it attains an age when the tenant is precluded from cutting it down; and so long as these hedges are suffered to continue of this size, so long will it be found almost impossible to get rid of the hedgerow timber. Again, the little value of these fences is another strong argument against them. What is the value of a few hundred house and kiln faggots once in eight or nine years in comparison with an acre of cultivated land, producing its corn and green crop every succeeding year? There is also another reason which renders large hedgerows injurious to the farmer, and that is because they are frequently full of gaps; and when once in that state, the cattle feeding in the adjoining fields will get into these gaps or breaks, and eat off the young underwood and grass, and increase these gaps in size, and the sheep will moreover crawl in among the bushes and tear their wool, giving them a very rough appearance, and injuring their growth of wool. And, lastly, the size of these fences contributes in a most material degree to deprive the fields of all the benefits of a free circulation of sun and air, which is perhaps the greatest injury these thick and numerous fences entail upon the land. It is well known that sunshine and a free admission of air are both essential in a primary degree to the growth of plants, and the proper ripening of corn; now these fences by their thickness and height deprive the adjoining land of these benefits. Again, on land lying in an open situation, exposed to the free action of the sun and air, the soil soon becomes dry enough, after rain, to enable the farmer to get upon his land to sow his corn; whereas in small fields, surrounded by large fences, he would have to wait three or four days longer before he would find his land in a fit state to be sown. The same

reasoning will apply to the carrying of corn and hay, the feeding off turnips, &c., in each of which cases the injury and delay caused by the obstruction of the sun and air are very great indeed. But in a wet harvest the total extent of the injury done is yet more fully developed, the crop being frequently laid by the rains, while no wind is able to get at the field and shake the wet off the straw, the crops consequently fall close to the earth, and should warm mild weather succeed, they will become grown, and in any case will be found light in yield and deficient in quality. And should rain fall in the interval between the cutting and the harvesting of corn, it will be found in these sheltered situations always to become grown the soonest, and to become very seriously injured; while at the same time corn will be standing in open and exposed situations perfectly free from harm. All these facts appear to be so plain and conclusive, as to the real injury entailed upon the farmer and the growing crops by this large thick kind of hedges, that I will now pass to the second head of the question, and endeavour to show that "They are injurious to the farmer by reason of their excess in number." And I do not know that I can more elucidate this point than by referring to the arguments advanced above in favour of the one-field system. I will therefore briefly recapitulate the heads of these arguments, adducing some few others as I proceed.

First. That the excess in number of the fences is injurious to the farmer, by deterring him from that perfect uniformity of system which he would otherwise be enabled to attain, and which lies at the root of all good farming, thereby preventing him from having his separate crops in each year lying in distinct pieces, each by itself, which would enable the farmer to obtain a great saving in labour, in ploughing, and in carriage and corn, &c.

Secondly. They are injurious by reason of those facts adduced before against the size of the fences, and which apply with fully as much force against their excess in number, viz., the liability of the crops to be laid, and become grown, and the exclusion of the sun and wind.

Thirdly. They are injurious because of the amount of fence which the farmer is frequently obliged to maintain at a very considerable cost, and yielding underwood, &c., insignificant in comparison with the amount of land upon which they stand. For it is clear that a vast amount of extra labour is entailed upon a farmer in having 10 miles of fence to maintain instead of 2 or 3 miles. The excess in the number of fences is moreover injurious to the farmer, who is anxious to thorough-drain his land; for he will, in some cases, be compelled to cut through several fences to find his drains a proper outlet, and will also be obliged to use much more labour in cleansing the ditches, to give them a sufficient

outlet, than would be the case where the drains are long and continuous, and fall into one common ditch. An argument may here be adduced against this system, on the ground that it would tend to make the drains of too great length, thereby preventing their proper working; but this might be easily obviated by having a ditch by the side of those roads or carriage-ways, which are absolutely necessary, even in the one arable field. But of course this will vary with the difference of situation; and therefore upon this point no general rule can be laid down. Again, by getting rid of the excess in number of hedges, the headlands would be ploughed in common with the rest of the field (in fact there would be no headlands), and those headlands, which very commonly in enclosed situations do not grow above one-half of the average produce of the field, would then produce the same.

I do not think that, since, as I have before stated, there are upon hill farms, in many parts of the kingdom, evidences of the practical working of the one-field system, and the advantage resulting from the destruction of the excess in number of hedges, it behoves me to say more upon the subject, except to endeavour to meet an objection which is certain to be here raised, and that is the following. It will be said that land lying cold and exposed will, during the frosts of the winter and the cold bleak winds of the spring, suffer more by exposure, and more damage would be done to the growing crops, than benefit would result by the free admission of the sun and air in autumn and summer. But the question is properly between lands lying in the same situation, and not those in a level compared with a hilly district; and without assuming that a plantation upon the most exposed side of a hilly farm would not be found most advantageous, I yet submit, that upon two farms of a level description, lying contiguous, the farm without fences would completely beat the one in small fields; while even in the most exposed situations, were land thorough-drained and kept perfectly dry, the damage suffered from exposure would be counterbalanced by the numerous other benefits obtained.

But to come to the last part of the points mooted by the Society—"The over-abundance of timber contained in the hedge-rows." There are many reasons why the over-abundance of hedge-row timber should be seriously injurious to the farmer. The principal way in which it is so, is in the damage which it causes to the growing crops in the adjoining fields. In many fields in enclosed and thickly-wooded districts in the kingdom, the damage caused by hedgerow timber is very great indeed; and in some fields (I will say for argument) of 5 or 6 acres, the growing crops upon the outside acre will not yield one-half of the average of the whole field. From the time the corn begins to grow away in the spring, the part round about and beneath large trees

standing in the hedgerows, will look sickly and yellow, instead of improving and becoming the dark luxuriant colour of the remainder of the field; and from that time until harvest there will be a decided and a continual falling off in the appearance of the crop, which eventually, when threshed, will present a deficit of one-half or two-thirds in the yield of grain and in the bulk of straw. There are many reasons which are considered to be the cause of the injury done to grain-crops by hedgerow timber, and the more prevalent one is that it is caused by the spreading of the roots. In some cases, and most generally in hop-grounds, trenches have been dug 6 or 7 feet deep, at a distance of 8 or 10 feet from the stem of the tree, and the whole of the roots running from the tree in that direction divided, and rendered innocuous. This plan, I am informed, has been attended in hop-grounds with considerable success. There is also a strong feeling that the damage occasioned is by means of the tree's shadow, and the consequent deprivation of sun and air experienced by the adjoining crops. This opinion is generally considered to be based on correct and scientific principles, for light being in a primary degree essential to the growth of plants, the deprivation which the shadow of the trees occasions to the land immediately adjoining is in the highest degree detrimental.

I believe that this theory will be found to be in accordance with facts. I have invariably observed, except in cases of very small fields, that trees cause less injury to the crops on the north than on any other side of the field; and I am strongly of opinion that if the roots of the trees on the northern side of a field were divided, no damage, except the small one caused by the drip of the trees, could be experienced; while I doubt whether if that plan were executed with trees on the southern side of the field, it would be found, though beneficial in some degree, entirely an effectual cure. And setting park-like beauty aside, what object can a landowner have in the preservation of hedgerow timber? In a pecuniary point of view he would surely be abundantly recompensed by the interest upon the vested capital realised by the sale of the timber, and the increased value of the land to the occupying tenant. Of course, the other arguments advanced before with respect to hedgerows, will be found in some measure applicable to the timber which they contain, while the grievous evil which their roots and shade cause to the adjoining crops, especially to the wheats, renders it in a high degree incumbent upon the landowner, who is anxious to see his land produce the utmost, to clear his property of "*the over-abundance of hedgerow timber.*"

In conclusion, I may be allowed to submit that the points advanced in the above observations are worthy of the serious attention of the landowners and farmers of England. Let the present

large fences in various parts of the kingdom be cut far closer and reduced within proper limits. Let those points which the Society have prominently put forward be fully attended to, and the magnitude of the present evil destroyed. Where, upon mature consideration, it is deemed necessary to maintain any fences, let their number be materially decreased; and if the whole farm be not thrown into one common field (I speak of the arable land), let the fields be increased to the size of 40 or 50 acres. But let the vast majority, and if there be not extremely strong and local reasons to the contrary, *the whole* of the hedges between arable lands be grubbed up; let the overabundance of hedgerow timber be felled, the roots be grubbed up, and the land upon which it stood be added to the adjoining fields. Let the landowners and farmers co-operate to carry out these improvements, and they will at no very distant day have the satisfaction of having (it may be in a less important degree than by uniform sound thorough drainage, but still in a very material degree) increased the production of the soil, and developed the agricultural resources of their native land.

Summerford, Withyam, Sussex.

XXXIX.—*On Drilling Maiden Earth for Turnips.*

By R. S. GRABURN.

To Mr. Pusey.

MY DEAR SIR,—It is evident in the districts where turnips have been repeatedly cultivated, that they certainly do not plant so uniformly, or grow so vigorously, as they did several years ago; that with the advantages of the present period in procuring artificial manures for the support of the established plant, fields repeatedly sown with turnips occasionally exhibit large patches completely bare; the seed vegetates, the young plant makes its appearance, after a few days turns yellow and dies, leaving the ground in spaces distinctly defined without a single plant; owing to the exhaustion of certain elementary parts of the soil necessary for the immediate support of the young plants, and not, as is frequently attributed, to the ravages of the wireworm.

To guard against this disappointment it has long been my practice to deposit with the seed, by the aid of the drill, a seed-bed of maiden earth and rotten dung, rich in the elements essential for the support of the young plant, securing the uniform and rapid growth always experienced in fresh broken-up ground.

The compost is formed from soil collected from the sides of hedges and roads mixed with spit dung, and frequently turned. It

is applied with increased advantage when moistened with liquid manure, and if too wet for readily passing through the drill, a sprinkling of dust from the roads is all that is requisite.

One hundred bushels per acre are sufficient to support young turnips until the roots are sufficiently developed to contend with ungenial soil, or to feed upon highly concentrated manures.

The advantages of this system cannot be too highly appreciated by the occupiers of soils considered precarious for the growth of turnips, upon which uniform crops may be secured by the deposition of an artificial "seed-bed." At Butleigh, near Glastonbury, upon a soil considered unsuitable for the successful growth of turnips, is now growing a crop of pink turnips weighing 30 tons 18 cwt. per acre, produced by 100 bushels of compost drilled, and 3 cwt. of Peruvian guano sown broadcast. The compost consisted of three parts of rotten turf and one part of short dung and road-dust. The field had been much exhausted by three white crops in succession.

The admixture of soils by the aid of the improved Lincolnshire drills has not sufficiently engaged the attention of the agriculturist. The cultivator of heavy clay soils is enabled to grow swede turnips by depositing with the seed "a seed-bed" of light earth in which the young plants will flourish until able to derive support from an imperfectly pulverized soil. The occupier of soils too light for the growth of heavy samples of wheat is enabled, by the deposition of a strong earth rich in the elements favourable to the support of wheat, to produce grain of good quality; and the occupier of peat-soils abounding in vegetable matter, but deficient in earthy substances, is enabled (in the absence of clay) by the frequent application of small quantities of earth, sand, or gravel, to convert a merely vegetable and root-producing soil into a highly valuable soil fitted for the growth of grain of excellent quality.

Yours, very faithfully,

R. S. GRABURN.

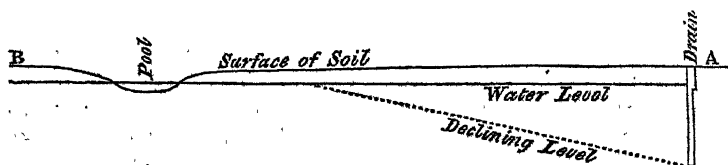
Walton, Clevedon, Somerset,
Dec. 10th, 1845.

XL.—On the Theory of Deep Draining.
By J. C. CLUTTERBUCK.

I SEE that the attention of the Royal Agricultural Society has lately been directed to the subject of deep draining; and as I have for some years past made observations on the percolation, subterranean flow, and drainage of water in various soils, I have referred to my memoranda in hopes that some of the many facts

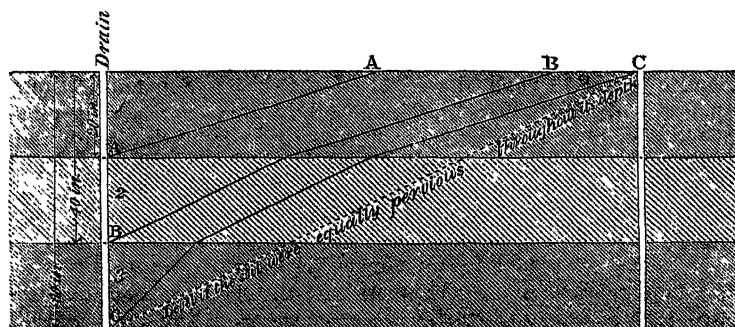
which have come under my notice may throw light on a subject of so much interest and importance to agriculture.

As the efficacy of draining must depend upon the condition of the soil in which it is executed, so, in determining the depth to which the drain should be cut, it will be necessary first to ascertain in what measure the soil is pervious to water. In blue clays this will in some measure be indicated by the change of colour caused by the action of the air, which, by peroxidising the natural protoxide of iron in the soil, changes the colour from blue to red or yellow; and in all soils the perforation by roots, &c. renders it more or less pervious to water for many feet from the surface. In flat unbroken ground, as the soil is saturated with the rain the water will rise gradually on a level throughout; should there be any depression in the surface it will form pools, the level of whose surface will coincide with the subterranean level, thus,



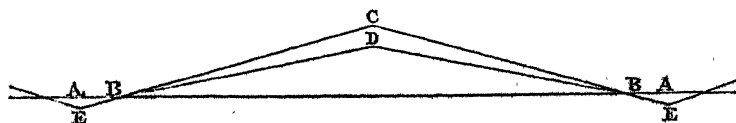
If a drain be dug at A, the level will assume an inclination, the angle at which it declines being greater or less in proportion as the soil is pervious to or retentive of water; in this, as in other cases of subterranean water flowing to a vent, "the inclination which its surface assumes will represent the amount of friction, or resistance, which the water encounters in its passage through the soil." Thus in the various chalk strata, through the fissures of which water flows with considerable freedom, this inclination is found to vary from 15 to 80 feet per mile; in other materials, such as sand or gravel, though loose, it is usually much greater, and in retentive clays will necessarily be greater still. It is with reference to the amount of this angle of inclination that all draining operations must be conducted. If, for instance, a soil is equally porous to the depth of 5 feet, it is obvious that a drain to that depth would drain it more effectually, and to a greater distance, than one of 4. 3, or less than that, and that the subterranean level would settle to a surface declining uniformly towards the drain. But as all clay soils are, from the above-mentioned causes, more porous at their surface than below, the angle at which various drains will act, and the extent of soil they will drain, will vary as they sink lower into the soil, though the deepest drain will *invariably* command the greatest amount of soil. Thus, if a soil become less porous in proportion to its depth (5 feet), as indicated in the diagram below

by the figures 1, 2, 3, then if three drains be cut 20, 40, and 60 inches deep, their draught or action on the soil will be indi-



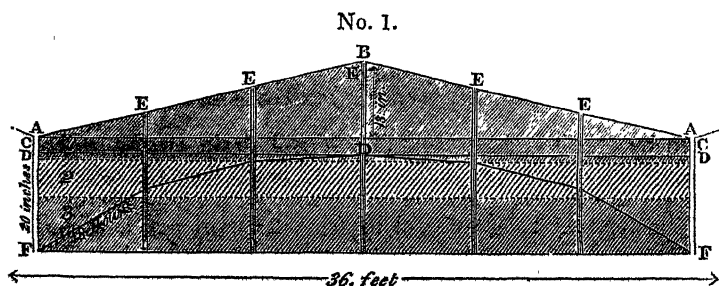
cated by the lines A, B, and C. A will drain on the surface a greater distance in *proportion* than B, and B than C; but B will command not only a portion of the subsoil, but also of the surface in stratum 1 not affected by A, and C will act in a similar manner with reference to 2, showing that deep drains must be the most effective; but to *ensure* this effectiveness the drains should be filled with some substance through which water can percolate freely throughout their depth.

In soil which has been broken up by the plough and ridged, the rain-water falling upon the surface will, as before described, pass through the soil at a level until it reaches the depression of the furrow, which, if the land be perfectly level, will become a pool or canal of water, as A A (usually called surface, or top water); if the land be inclined the furrow will become a small stream, and by carrying away the water will act as a vent, and partially drain the ridge. Under a continuance of rain the level between

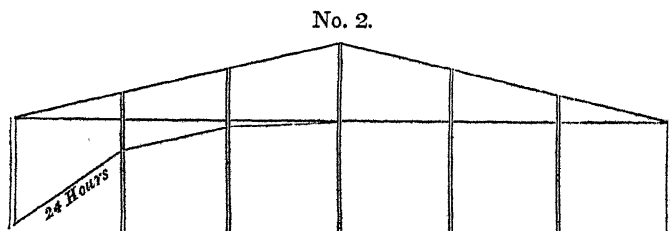


the furrows and the ridge will assume an inclination proportionate to the tenacity of the soil, thus; if B C be the inclination of the ridge, and B D the inclination assumed by the water level, the space between these two lines will show the amount of soil drained by the furrow, E; thus, when the height of the ridge is greater than the summit of the inclination at which the water level stands, it is erroneously concluded that the land is effectually drained; yet wheat which looks well on heavy lands early in the spring, will turn yellow in a wet May, the period when the roots

are descending into the subsoil, where the water, hidden from the farmer's eye, remains stagnant. But let the furrow be converted into a drain, and the effect will be represented by the subjoined diagram, made from actual observation, the level of the water in the soil having been taken previously to digging the drains in November, 1843, and the effect of the drainage noted 48 hours after the drains were cut. The soil in this case (gault clay) might be divided as above:—1, the tilth; 2, yellow clay, rendered porous by the action of the air; 3, blue clay, rendered partially porous and pervious to water by roots, &c.



A A, two drains 36 feet apart; A B, surface of the soil, the ridge 13 inches above the furrows C C; the level at which the water stood before the drains were cut, D D D, and the inclined water level F D F, 48 hours after cutting the drains; E E E E E, five holes in which pegs were placed with their tops all level, and by which the sinking of the water was measured.



Section of another land, showing the action of one drain before the second was cut. Vertical scale one-twentieth of an inch to an inch; horizontal scale one inch to six feet.

This land was planted with beans in March. In the part that was drained the beans grew to the greatest height, and were otherwise better *nearest* to the furrow, and shortest at *the ridge*, so that, notwithstanding 13 inches' rise at the ridge, the crop presented a level surface; in the part undrained the furrow was nearly bare, and the form of the ridges very apparent.

The levels were all carefully taken with a telescope level—a bricklayer's level, 6 feet long, would I conceive answer the purpose of ascertaining the relative level of water in holes 6 feet apart. The simplest method is to dig the required number of

holes in a straight line at equal distances across the land, then to place in these holes pegs, of which the tops should all be on a level: this should be done *previously* to cutting an experimental drain, of which the depth might be gradually increased, and the effect would be shown by the sinking of the water in the different holes. The best time for observation is when heavy rains are followed by fine weather, leaving the level undisturbed; corresponding observations should also be made in a similar soil not subjected to the action of drains, that the two may be compared. In the clay soil, where most of my observations have been made, after the summer of 1844, which was unusually dry, no more than 4 inches of rain, falling within 30 days, saturated the soil, though the drains cut in the previous winter ran before any water could be traced as stagnating in the soil—a fact worth notice, and I think to be easily accounted for by the extent to which the ground was cracked, by which the water, falling in heavy showers, ran at once down these channels into the drains. A few simple observations, made as I have attempted to describe those made by myself, would I think satisfy any one within 48 hours that deep drains must be more effective than shallow, the former scarcely draining the tilth, the latter the subsoil.

XLI.—*Observations on the Natural History and Economy of various Insects, &c., affecting the Corn-crops, including the parasitic Enemies of the Wheat-midge, the Thrips, Wheat-louse, Wheat-bug, and also of the little worm called Vibrio.* By JOHN CURTIS, F.L.S., Corresponding Member of the Imperial and Royal Georgofili Society of Florence; of the Academy of Natural Sciences of Philadelphia; &c.

PAPER X.

CECIDOMYIA TRITICI—The *British* Wheat-midge.

I HAD hoped, during the past summer, to make some progress in the further development of the economy of the Wheat-midge; but although the little orange larvæ were abundant in some wheat-fields in August in this neighbourhood, owing to the wet and cold season I presume, I did not discover a single midge on the wing, and the larvæ appear to have all died as usual. I have, however, collected materials for detailing the histories of several minute *Ichneumonidæ* that attack the Wheat-midge, which are too interesting and important to be passed by without comment. The most abundant and, consequently, the most useful of them is

one named *Ichneumon Tipulæ*, by Mr. Kirby, who remarks, "It is singular, but most people who are acquainted with the larva of the *Tipula Tritici* mistake this friendly *Ichneumon* for its parent, and thus impute all the mischief to the very creature which is appointed to prevent it."*

This insect is found upon grasses as early as June, and on the glumes of the wheat in July and August, when it runs over the ears and searches out the infected ones, depositing a single egg in each of the larvæ by means of its sharp tail. The late Mr. A. Mathews, before he left England, sent me specimens, informing me that he had found them in the greatest abundance in the glumes of the wheat in a field near Sittingbourne, Kent, the beginning of July. Never having seen this *Ichneumon* depositing its eggs, I cannot satisfy the curiosity of the reader better than by transcribing Mr. Kirby's graphic account of its operations. "To see our little *Ichneumon*," says Mr. Kirby, "deposit its egg in the caterpillar of the wheat-fly is a very entertaining sight. In order to enjoy this pleasure I placed a number of the latter upon a sheet of white paper, at no great distance from each other, and then set an *Ichneumon* down in the midst of them. She began immediately to march about, vibrating her antennæ very briskly; a larva was soon discovered, upon which she fixed herself, the vibratory motion of her antennæ increasing to an intense degree; then bending her body obliquely under her breast, she applied her anus to the larva, and during the insertion of her *aculeus* and the depositing of the egg her antennæ became perfectly still and motionless. Whilst this operation was performing, the larva appeared to feel a momentary sensation of pain, for it gave a violent wriggle. When all was finished, the little *Ichneumon* marched off to seek for a second, which was obliged to undergo the same operation, and so on to as many as it could find in which no egg had been before deposited, for it commits only a single egg to each larva. I have seen it frequently mount one which had been pricked before, but it soon discovered its mistake and left it. The size of it is so near that of the *Tipula*, that I imagine the larva of the latter could not support more than one of the former, and, therefore, instinct directs it to deposit only a single egg in each; besides, by this means one *Ichneumon* will destroy an infinite number of larvæ."

These parasites are all included in the Order HYMENOPTERA, and the Family ICHNEUMONIDES ADSCITI; the species I am about to describe is comprised in the Genus PLATYGASTER;† it has been named by Mr. Kirby *Ichneumon Tipulæ*, and is now described as the—

* Trans. Linn. Soc., vol. iv. p. 236.

† So named from some of the larger ones having broad bodies.

1. *P. Tipulæ*. Pl. N. fig. 1; *a*, the natural size.—*Female* pitch-coloured, shining: antennæ nearly as long as the body, inserted at the lower part of the face, slender, clavate, geniculated or angulated, as if broken, slightly pubescent, ochreous, and ten-jointed, the four terminal joints brown and obovate, the apical one conical; basal joint long, curved, and clavate; second and third subovate, the latter very slender; fourth a little longer; fifth and sixth minute (fig. *b*): head black, subglobose, thickly and finely punctured, with a minute tooth between the base of the antennæ; eyes oval and lateral, ocelli large and placed nearly in a straight line across the crown: thorax somewhat globose with minute pale pubescence; scutellum horizontal, long, conical, and mucronated; the spine ferruginous: abdomen small, scarcely larger than the thorax, slightly depressed, obovate, black and very shining, attached by a short stout pedicel which is ferruginous at the base; the second segment forms a convex shield, which nearly covers the back, with three or four rings towards the apex; the flexible tip is armed with a very long curved ovipositor, like a hair, which is concealed in the abdomen when at rest: the four wings transparent, iridescent, pubescent, and ciliated, destitute of nervures, the superior much the largest, the apex quite round: legs strong, bright ochreous; thighs thickened at their extremities; tibiæ spurred at the apex, very clavate, hinder with the knob sometimes fuscous; tarsi slender and five-jointed. “*Male* black, shining, very smooth, sparingly clothed with short pubescence: head excessively finely punctured, slightly shining: eyes and ocelli pitchy black: antennæ pitchy, first to fifth joints reddish: apex of scutellum fuscous; metathorax and first abdominal segment rough, obscure, pilose: abdomen smooth, shining; second segment with two little pits at the base; legs pale reddish; hinder tibiæ and apex of tarsi pitchy: wings somewhat transparent: scales pitchy.”

It seems that the males do not differ, except in a trifling degree, in the structure of the horns, in which, I believe, the fourth joint is larger and the tenth longer and more pointed; but it is very remarkable that whilst the females occasionally swarm, so little is known of the habits of the opposite sex that I have not yet been able to meet with a specimen. The only one I ever saw was captured by Mr. Haliday on a rose-tree, and the above characters are translated from Mr. F. Walker's paper upon the Genus *Platygaster*.* This is such an extensive group that he has described 99 species which inhabit this country, and amongst them is one named *P. Triticæ* by Mr. Haliday, who found it on corn and willows in England and Ireland, and from its specific name it is evident that ta-

* Entomological Mag., vol. iii. p. 230.

lented naturalist considered it to be connected with our wheat-fields.*

The second species described by Mr. Kirby he has named *ICHNEUMON INSERENS*: it is apparently a *PLATYGASTER*;† but as I have not been able to find the specimen in his collection, I must be satisfied in transcribing his account and copying his figures. He says, "Upon the 7th of June I observed a very minute *Ichneumon* exceedingly busy upon the ears of wheat, which, at first, I took for *Ichneumon Tipulæ*; but upon a closer examination I found it to be a species entirely distinct, as will appear when I come to describe it. As soon as I was convinced of this, and observed that it pierced the florets at a time when no larvæ had made their appearance, I conjectured that it must lay its eggs in the eggs of the *Tipula*." "This insect is furnished with an *aculeus* three or four times its own length (fig. c), which is finer than a hair and nearly as flexible; this is commonly concealed within the abdomen, but when the animal is engaged in laying its eggs it is exerted: one day it gave me a full opportunity of examining this process. It inserts its *aculeus* between the valvules of the corolla near the top of the floret; its antennæ are then nearly doubled and motionless, its thorax is elevated, and its head and abdomen depressed; the latter, when it withdraws the *aculeus*, is moved frequently from side to side before it can extricate it. This insect has allowed me to examine its operations under a lens for six or seven minutes: upon opening the floret into which it had introduced its *aculeus*, I could find neither egg nor larva of the *Tipula*; but, upon examining it very closely under three glasses, I discovered, scattered over one of the valvules of the corolla, a number of globular eggs extremely minute, evidently not those of that insect. It is possible that there were in this floret eggs of the latter, which might be destroyed upon opening it, or escape my observation. At other times I have found eggs of the *Tipula Triticæ*, and once some larvæ, in florets upon which I had observed this *Ichneumon* busy." "From the time in which it first makes its appearance, ten days before the hatching of the first larvæ, I am inclined to adopt my original conjecture, that the eggs are its prey; and yet there seems not to be a sufficient disproportion between the size of the one and the other for this purpose; at least, it must take more than one to nourish a larva of the *Ichneumon* to its proper size."‡

* Curtis's Brit. Ent., fol. 309; and Guide, Genus 585, where 108 species are recorded.

† I have included it in the Genus *Inostemma* in the 'Guide,' a Genus which has been formed out of *Platygaster*; but whether I have been right in its location, I am unable at present to determine for want of materials.

‡ Trans. Linn. Soc., vol. v. p. 102.

2. *Platygaster? inserens*, Kirby. "Very black; antennæ clubbed; abdomen lance-shaped, shining:—" * fig. 2; *e*, the natural size.—*Female*, body very black: antennæ bent, as if broken, and clubbed; basal joint long, stout, rigid, and clavate, reverse heart-shaped, cleft at the apex viewed laterally; second joint stout, oval; 4 following globular and extremely minute, the remainder forming a compact ovate conic club of 4 joints (fig. *d*): head and thorax somewhat dull in surface: abdomen sessile, lanceolate, excessively black and glossy, very acute, furnished with a very long flexile slender ovipositor, which is exerted (fig. *c*); wings transparent, nerveless, longer than the body; superior with a black line leading from the base towards the middle terminated by a black dot: legs blackish; thighs deep black, somewhat clavate; length less than a line.

The third parasite detected by Mr. Kirby appeared on the same day that the *Platygaster Tipulæ* came forth in great numbers. He states that, "on the 22nd of June, I observed another *Ichneumon* not uncommon piercing the florets of the wheat (figs. 3 and 4). This species did not appear to insert its *aculeus* between the valvules of the corolla, but to pierce the glumes of the calyx, to effect which purpose it is armed with a very short one sub-exserted: of this I found both the sexes; the male was distinguished from the female by its large eyes, placed very near each other, with reticulations unusually visible. I presume this to lay its eggs in the larvæ, but have not been able positively to ascertain the fact." †

This singular species has been characterised as the Genus *MACROGLENES* by Mr. Westwood, and I am happy in being able to give drawings from nature of the sexes, as the figure in the Linnæan Transactions is not sufficiently correct to identify it. ‡ Mr. Westwood, however, has examined Mr. Kirby's original specimen of *Ichneumon penetrans*, and informs me that it is identical with his Genus *Macroglènes*, which is comprised in the Family *CHALCIDIDÆ*, a parasitic group of immense extent as to amount of species, and scarcely yielding in numbers to any of the insect tribes as to aggregate masses. I have already described and figured several species of *Chalcididæ*; they frequently inhabit and feed upon the parasitic larvæ of *Hymenoptera*, to keep them within due bounds.

3. *Macroglènes penetrans*.—The *male* is dark blue-green, sometimes slightly tinged with violet, shining; antennæ not so long as the head and thorax, geniculated and clavate, ten-jointed, basal

* Trans. Linn. Soc., vol. v. p. 107.

† *Ib.*, p. 104.

‡ Mr. Haliday presented me with a male; for the loan of the other sex I am indebted to Mr. F. Walker.

joint long; second as stout, oval; three following very minute and saucer-shaped; sixth and seventh stout, cup-shaped; the remainder forming a compact black ovate-conic club: head large and transverse, face orbicular, including the eyes, which are very large, lateral, reddish brown, orbicular, coarsely reticulated and approaching each other on the crown: ocelli 3, forming a long triangle, prominent and larger than usual, especially the apical one: thorax oval, as broad as the head; the sutures deep, forming 4 very convex protuberances: abdomen very much compressed, not longer than the thorax, and somewhat elliptical viewed laterally, with six distinct segments, and a short exerted slender process at the apex: wings ample, very transparent, iridescent; superior with a subcostal nervure reaching nearly to the middle, where it unites with the costa, and a little beyond it forms a short branch, terminated by a minute dot: legs simple and slender: tarsi five-jointed, dirty white, darker at the tips (fig. 3; *f*, the natural size): length three-fourths of a line, expanse one and two-thirds of a line. The *female* is scarcely so large, and differs, I think, in having shorter antennæ, with a more abrupt club; the face is very concave, forming a broad deep groove: the 3 ocelli are placed in a transverse line at the back of the crown: the eyes are not large, but brown, oval, and remote: the abdomen is very much compressed, the back forming a sharp edge, and it is very deep viewed laterally, the apex is truncated, and an oviduct enclosed between two valves projects beyond it; fig. 4; *g*, the natural size.*

There is also a group of flies belonging to the Order DIPTERA, and the Family EMPIDÆ, forming the Genus EMPIS, several species of which carry off and devour the *Tipula Tritici*.† Mr. Kirby has not recorded the species; but to enable the agriculturist to recognise this useful tribe of flies, I will figure one named by Linnæus *Empis livida*, which is abundant everywhere at the end of June, and I have repeatedly taken it in corn-fields: fig. 5; *m*, the natural dimensions.

4. *Empis livida*.—*Male* deep ochraceous, clothed with short black pubescence and scattered bristles: head small, globose; eyes large and contiguous; ocelli 3, placed at the back of the crown in a triangle: antennæ inserted in front of the face, approximating, stretching forward, shorter than the head, and five-jointed; two basal joints brown and bristly; first elongate-ovate; second subglobose, the remainder black; third compressed, much longer than the first, dilated at the base and tapering to the apex; fourth minute, cup-shaped; fifth elongated and forming a shortish

* Mr. Haliday has described two more species of this genus in vol. iii. of the Trans. of the Ent. Soc., p. 295; he found all of them in various wild flowers.

† Trans. Linn. Soc., vol. v. p. 105.

bristle (fig. 6, *h*) : proboscis pendent or inflected under the breast, horny, twice as long as the head, and much longer in some species, resembling the beak of a bird (fig. 6); the labrum, or upper lip (fig. *i*), is hollow, dilated at the base, cleft at the apex, enclosing a horny, slender, acute tongue and two very long and slender maxillæ, with minute palpi, or feelers, at the base (fig. *l*); the under lip is very long, bilobed, and bristly at the extremity (fig. *k*) : the thorax is ash-coloured and oval, with three blackish stripes down the back and a few black bristles; the scutellum is somewhat crescent-shaped, the margin ochreous; abdomen somewhat linear, and seven-jointed, the apical joint nearly globose, but cleft : wings ample, incumbent, and parallel in repose; pale smoky-ochreous, with the third subcostal nervure forked at the extremity, and a conical cell on the disc : halteres pale ochreous and clubbed : legs long and stoutish, especially the hinder pair; thighs and tibiæ simple; tarsi tapering, brown, and five-jointed, basal joint the longest; claws and pulvilli minute, the latter bilobed : length 3 lines, expanse 7 lines and upwards. The *female* (fig. 5) is larger than the male and of an ash-colour : head globose (fig. 6); eyes large, but not contiguous; the rostrum longer and thicker than in the male : abdomen stoutish, of the same colour as the thorax, but the incisures are more slate-coloured, the apex conical and terminated by two compressed black slender lobes; ovipositor long, slender, and contractile : the wings are perfectly transparent : the legs are ochraceous; all the thighs, except the intermediate, are densely ciliated beneath with black hairs.

The sexes of this fly are so different in the colour of the wings and body that no one would take them for the same species, if they were not often observed in pairs.

The THRIPS.

Every one must be acquainted with a little black slender insect which alights on the face in hot weather, causing an intolerable irritation of the skin by running and leaping about with its bladder-tipped feet, throwing up its head and twisting about its tail to expand or close its beautifully fringed wings. I know of no other name for it than *Thrips*; and a closely allied species, if not the same, is accused of doing considerable mischief to the corn-crops. The *Thrips* are all very minute, and many of them very mischievous; one species often swarms upon peaches and other wall-fruit, as well as on melons, &c., in frames;* another causes great injury to the olives in Italy;† and a third species is very destructive in hot-houses; but that which the farmer has to contend with

* Gard. Chron., vol. i. p. 228.

† Passerini's Notizie sopra una Specie d' Insetto del Gen. *Thrips*.

is the *T. cerealium*, which Mr. Haliday says is "exceedingly common on grass and *cereal*ia. Mr. Kirby found specimens in the furrow of the grains of wheat. Earlier in the year Mr. Vassalli-Eandi detected them gnawing (as he expresses it, rather incorrectly, I think) the stems above the knots, and causing the abortion of the ear. It is at this period that their attacks are most mischievous. In the year 1805 one-third of the wheat-crop in the richest plains of Piedmont is said to have been destroyed by this seemingly insignificant little insect. Whatever the causes may be which produce the alarming increase of these tribes, they appear to operate almost periodically, and over a wide space; for in the same year (1805) the wheat-crops in England also suffered from a similar disease, as the communications in contemporary periodicals inform us."* The rye-spikes also in Scotland are reported to become unprolific from being infested by some of these insects.

At an early stage of these inquiries the minuter species of insects were so ill described that many were confounded under the same name, and such was the case with many of the *Thrips*, which had been called *physapus* by every one who wrote upon the subject; but at this time there are above 40 species described by Mr. Haliday,† from whose Monograph it appears that the insect affecting the corn crops is a distinct species. They form an Order named THYSANOPTERA, from the plume-like fringes of the wings, but they were at first included in the *Hemiptera*, and subsequently formed a section of the *Homoptera*: our insect is comprised in the Genus *Thrips*, and forms a Sub-genus called LIMOTHrips, and the specific name is—

5. *T. cerealium* of Haliday, and *T. physapus* of Kirby.—The larva and pupa are similar in form to the imago, but smaller; "the larva is deep yellow, with the greater part of the head and two spots on the prothorax dusky. The antennæ and legs have alternate rings of pale and dusky: the pupa paler yellow, with the antennæ, legs, and wing-cases whitish, the latter reaching to the middle of the abdomen. The eyes are dusky red, and the simple eyes sometimes indicated by red dots."‡ The perfect insect is smooth, shining, piceous, often black, depressed, and about three-fourths of a line long. The male is apterous, the female winged: the head is ovate-truncate, concave on the crown, with a channel down the centre: ocelli 3, distinct, forming a large triangle on the crown: eyes remote from the base, lateral and oval, coarsely granulated; the collar not contracted: antennæ inserted before the eyes, approximating, a little longer than the head, slightly

* Haliday in Ent. Mag., vol. iii. p. 445.

† Ib., p. 439; and Curt. Guide, Genera 1048.

‡ Ent. Mag., vol. iv. p. 146.

bristly, nine-jointed, two basal joints the stoutest, oblong; the third and fourth rather longer, obovate, with a gland at the apex appearing like a small joint; fifth obovate; sixth elongate-ovate, truncated, the remainder tapering; seventh oblong; eighth minute; ninth twice as long, very slender, the apex pilose: face inclining obliquely beneath, terminated by the trophi, which unite and form a short beak close to the anterior coxæ:* thorax somewhat quadrate, sometimes a little narrowed before with four impressed dots, two on each side; scutellum short, somewhat lunate: abdomen long, narrow, and smooth, composed of nine segments; apex ovate or conical and bristly, the last segment armed with two lateral spines in the male; acuminate in the female: ovipositor or borer four-valved, incurved, compressed, concealed in the under-side of the eighth and ninth segments: wings four, as long as the body, narrow, horizontal, incumbent, and parallel in repose, but curving outward and not meeting; superior rather coriaceous, fuscous, but pale at the base, ciliated with long hairs, and having three longitudinal nervures; inferior a little shorter, membranous, transparent, and iridescent, likewise ciliated: legs remote, anterior very short and stout in the female, hinder the longest; first pair of thighs thickened, but compressed in the female; anterior tibiæ straw-coloured in the same sex, with a protuberance on the inside and a curved claw at the apex; the others simple; tarsi very short, straw-coloured, biarticulate, basal joint oblong; second short, terminated by a little gland; claws none. Fig. 8 exhibits the female walking; fig. 9 the same sex flying, both greatly magnified, as is shown by their natural dimensions at figs. *n* and *q*.

I have repeatedly observed these insects running amongst the chaff or husks on the ears of wheat in great abundance, in every stage of growth, with the larvæ of the Wheat-midge in June; in August in company with the *Aphides*, and in July, on opening some barley-straw (fig. 7, a portion split longitudinally), to investigate the economy of the *Chlorops* and its parasites, I found groups of the orange-coloured larvæ (fig. *o*) and the perfect black *Thrips* (fig. *p*) between the spathes, and the former were also secreted in the ears amongst the incipient grains. Mr. Kirby remarked that "of all the insects that are found in wheat the *Thrips physapus*, in all its states, is by far the most numerous. I do not recollect examining a single ear in which it was not to be found; and my opinion still remains unaltered, that it derives its nourishment from the grain." †

* For descriptions and figures of the mouth, antennæ, &c., consult Curtis's Brit. Ent., fol. and pl. 748.

† Linn. Trans., vol. iv. p. 239.

As Mr. Kirby's letter to Mr. Marsham, dated August 27, 1795, comprises all that is at present known relative to the injurious effects of the *Thrips* upon the corn-crops, I shall transcribe the most important passages:—"I examined a great number of ears, and in them found this insect in all its states, between the *interior valve* of the *corolla* and the grain. It takes its station in the longitudinal furrow of the seed, in the bottom of which it seems to fix its rostrum; probably sucks the milky juice which swells the grain, and thus by depriving it of part, and in some cases perhaps the whole, of its moisture, occasions it to shrink up, and become what the farmers in this part of the world (Suffolk) call *pungled*. If your correspondent in Hertfordshire means the same insect, he is mistaken in asserting that only a single grain in an ear is injured by it. I have myself seen ears in which a *fourth part* of the grain was destroyed, or materially hurt. I have frequently seen two of the insects upon a single grain, and am told that sometimes more are observed. What is singular, when I met with them on the grain in the *imago* state, they were often in *pairs*, one of which was *apterous*. These I take to be the sexes. I once found a large species, *uno aculeato* (*Thrips aculeata*, Mus. Kirby) in which the same distinction takes place. The larva of *Thrips physapus* is yellow, has six legs, which, with the antennæ and head, are black and white. Sometimes it is all yellow. It is very nimble in its motions, and although brought away in the grain soon makes its escape. The *pupa* is whitish, with back eyes, and wings apparent. It is very slow and sluggish in its motions." "There was an orange-coloured powder in every grain in which the insect was found, which I imagine is its excrement. All the farmers that I consulted respecting it agreed in saying that it did most mischief to the *late-sown* wheats, and that such as were sown early received little or no injury. This, I think, very probable; for when the grain is arrived at a certain degree of hardness and consistency (which perhaps was the case with the early-sown wheats before the insect made any material attack), I suppose it is not liable to be hurt. Linnæus says of this insect, '*spicas secales inanit*;'† but nobody seems to have apprehended the injury it is capable of doing to wheat. An intelligent farmer, who first pointed it out to me, assured me that he was firmly persuaded that it was this insect which occasioned what was called the blight last year, which was the cause of so defective a crop. The part of one field that I examined, and which was particularly injured, was to the north of a high hedge:

* *Vide* Linn. Trans., vol. iii. p. 246.

† *Viz.*, "it empties the ears of rye."—Linnæus's Syst. Nat., vol. i. pars 2, p. 743.

but the above-mentioned farmer informed me that he had found them plentiful in a very *open* country. To me they appeared more injurious in the *heavy* than in the *light* lands. Last year the bearded wheat (called by our farmers *clog-wheat*) escaped with the least injury; but this year, as far as my information and observation went, it was the most injured. I observed in one or two instances the *Forficula auricularia* upon the ear; and upon examining the grain, each time, to which it had applied itself, I found upon it the *Thrips*. Query:—Does it not devour them?" "The only method which can be serviceable to prevent the ravages of this insect is, to sow the wheat early. It is probable that it does considerable damage *every* year, as it is a very common insect. Nor do I imagine that it has been more injurious than usual in the present year, only the scarcity has excited people's attention to everything that might hurt the grain."

We may just observe, that as the earwig is now well known to feed upon vegetable substances, it seems doubtful that it renders any service in reducing the numbers of the *Thrips*; but as it is also reported to feed upon *Aphides*, this interesting question requires to be more fully investigated. The red dust which was supposed to be the excrement of this insect was no doubt the minute fungus called rust, &c.* At the period when the above letter was addressed to the Secretary of the Linnæan Society great scepticism seems to have existed as to the insects having injured the crops. In such matters we can often only draw our conclusions from analogy, and there can be no doubt from the mischief which is done to the foliage of melons, cucumbers, &c. by another species of *Thrips*† that the *T. cerealium*, called, it must be remembered, by Mr. Kirby *T. physapus*, exhausts the juices of the wheat, and causes the grains to shrivel; and probably the abortion of a portion may be traced to their puncturing the tender straw at the joints.

It only remains to observe of this pest, that it is frequently attacked by parasites and other enemies, one of which is an *Ocyptes*; and *Thrips cerealium* is often covered with the small white mites that are found in damp hay,‡ which feed upon the insect.

APHIDES OR PLANT-LICE.

The corn-crops do not escape the visitations of this extensive tribe; indeed, what crop does? We have already seen three species swarming upon the turnips, and another often destroys the fairest prospects of the hop-grower in a very short space of time.

* *Vide* Professor Henslow's Report in the Journal of the Royal Agric. Soc., vol. ii. p. 9.

† Gardener's Chronicle, vol. i. p. 228—*Thrips ochraceus*.

‡ Ent. Mag., vol. iv. p. 144.

Mr. Markwick, whom we have so frequently mentioned, found the Aphides, or Dolphins as they are called in some counties, infesting the wheat-ears the second week of July, 1797. Mr. Kirby also reported this Aphis to be sufficiently common upon barley and oats as well as wheat in the same year; and as Fabricius has given no description of his *Aphis avenæ*, which is possibly the same species, Mr. Kirby was constrained in describing it to designate it by a new name.* This insect belongs to the Order HOMOPTERA, the Family APHIDIIDÆ, the Genus APHIS, and the species is called

6. *A. granaria*: it is green when alive, changing to an olive ochraceous or brown colour when dead: the antennæ are very slender and tapering, as long as the body, inserted close to the inner margin of the eyes, in front of the face, composed of seven black joints, more or less ochreous at the base: first joint stout and ovate; second, subglobose; third, very long; fourth and fifth, decreasing in length; sixth, not longer than the first; seventh, very slender, and as long as the third: head fixed, small, transverse-oval; eyes lateral, remote, dark and globose; ocelli three, forming a large triangle, one being placed near the inner margin of each eye, the third upon the anterior margin of the forehead: trophi forming the rostrum or mouth arising at the lower part of the face, between the anterior coxæ; under lip not much longer than the head, four-jointed, pointed, black, ochreous at the base, inclosing two maxillæ and two mandibles, which form an exceedingly slender, horny, long tongue: thorax moderately large, globose, the disc dark, collar much narrower; scutellum semicircular: abdomen stout, oval, with two slender black tubercles or tubes on each side of the antepenultimate joint, furnished with a horny process at the apex in the female: wings four, deflexed in repose (fig. 7), transparent, iridescent; superior very ample, twice as long as the body, stigma long and green, the costal cell rather small and somewhat oval, the furcate apical cell small; inferior wings much smaller, with two oblique nervures. *Females* often apterous: legs long, slender, and green, with short hairs on the tibiæ; thighs black, except at the base: shanks black at the apex; tarsi biarticulate, of the same colour, with two minute claws: fig. 10 magnified and represented flying, fig. 7 the natural size.

On the 12th of July, 1842, I detected many of the apterous *Aphides* amongst the chaff of the wheat-ears, apparently sucking the stem; they were brown and shining; and in looking over some wheat-fields at Cranford with Mr. Graham, the middle of last August, we found numbers of the *Aphides* in every stage of

* Linn. Trans., vol. iv. p. 238.

growth, from minute ones that were just born to the full-sized and winged parents. I observed that all which had not arrived at their last stage had shorter legs than the others; the largest ones were of a dull orange-colour; the antennæ, except at the base, the eyes and abdominal tubes, the extremity of the tibiæ and the tarsi were black, and the thighs pitchy towards their apex (fig. 11; s, showing the natural size). With them were multitudes of dead *Aphides*, whose history I shall now relate.

Opportunities have repeatedly been afforded us in the course of these investigations, of showing the wonderful ways by which Providence has provided agents to restrain the ravages of noxious insects, which without such checks would frequently render man's greatest efforts abortive; and as there is no tribe of insects more subject to parasitic enemies than the *Aphides*, we may reasonably infer, indeed it is proved by experience, that when such checks are withheld, our crops will suffer severely from the superabundance of insect tribes. The wheat-ears this year afforded a beautiful illustration of the economy of parasitic insects and the benefits resulting from their agency: on some wheat which we examined, not a single *Aphis* had escaped the searching vigilance of its enemies, and the husks were spotted with immovable black shining globules, as represented in plate O, fig. 20, b: on a closer examination it was evident that these were *Aphides* which had been punctured by minute parasitic flies, and that as they increased in bulk, the little internal maggots fattened upon their muscles, until the *Aphides* died from exhaustion, their bodies being gummed by a natural secretion to the chaff and stalks, their antennæ and legs remaining just as they were during life, and likewise retaining their natural colours. I placed these infested ears in a box, and after a short time I bred from them two distinct species of parasitic flies, as well as a third from another wheat-ear, all of which I will now describe.

They belonged to the Order HYMENOPTERA, the Family ICHNEUMONIDES ADSCITI; and the first to the Genus APHIDIUS: the Species is named by Mr. Haliday

7. *A. Avenæ*.* In the *Male* the antennæ are dull black, filiform, compressed, inserted in front of the face, scarcely so long as the body, and composed of twenty joints, the two first forming an oval shining mass: head and thorax smooth, shining black, the former transverse oval; eyes rather small, and somewhat lateral; ocelli large, forming a triangle on the crown: thorax with a double channel down the fore part of the disc; collar very short and narrow; scutellum semioval; postscutellum and abdomen with a few whitish hairs as well as the thighs; pedicel rather long, nar-

* Ent. Mag., vol. ii, p. 99.

row, rugose and black, the base ferruginous; abdomen brown, smooth, shining, and shuttle-shaped, the margin of the segment next the pedicle, and a suffused patch on the back, ochreous: wings transparent, iridescent, and pubescent; superior with a large cubital-internal cell, imperfectly closed externally, and producing two rudimentary nervures only; all the posterior marginal and the radial cells wanting; stigma large, yellowish-brown, forming a thickened costa towards the apex: legs subferruginous; all the coxæ and thighs, excepting the first pair, pitchy; their tibiæ clouded with the same colour; tarsi 5-jointed and blackish, basal joint considerably the longest in the hinder pair; claws minute; pulvilli longer: fig. 12 *t*; showing the natural size.

This was produced from a large testaceous female *Aphis* found upon an ear of wheat the middle of July (fig. 13; *u* the natural size). It made its exit near the tail, as shown in the figure. We learn from Mr. Haliday, that whilst the male *Aphidii* are hovering over the plants infested by the *Aphides*, the female is engaged in laying her eggs, which she effects by bending her body under her breast; and, by lengthening her tail, the ovipositor is conducted under the *Aphis*, and an egg is instantly inserted in its belly near the tail; she then searches for another suitable victim, passing by all those which have been already inoculated.

From the dead female *Aphides* of a black colour (fig. 20 *b*) I bred an allied insect, named by Mr. Haliday * and Nees ab Essenbeck.†

8. *Ephedrus plagiator*. *Female* clothed with a few pale scattered hairs: antennæ black, filiform, considerably shorter than the body, 11-jointed, two basal joints small, 3rd the longest, following elongated: head and thorax black and shining, the former transverse-oval; eyes small, somewhat lateral; ocelli 3 in triangle on the crown: thorax gibbose-ovate; collar short and narrow; scutellum semioval; pedicle long, narrow, and rugose; abdomen small, shuttle-shaped, smooth shining brown, the base and disc ochreous-brown, apex furnished with two slender horny pointed lobes: 4 wings transparent, iridescent, with a slightly smoky tinge, nervures brown, superior with a long, yellowish-brown stigma, the costal nervure extending to the extremity of the radial cell, which is large and perfect; there are also 3 complete discoidal cells, and the external cubital cell is nearly perfect: legs ochreous, four hinder thighs and the tarsi pitchy, tips only of the first pair fuscous (pl. O, fig. 21; *c* the natural size).

This little insect is exceedingly like the preceding one; but there are fewer joints in the antennæ, and, on comparing the wings, it will be seen that the nervures are different, and the cells more

* Ent. Mag., vol. i. p. 486.

† Hymenop. Ichneu. affin. Monog., vol. i. p. 16.

numerous: it has also been remarked by Mr. Haliday, that the *Ephedrus* pierces the backs of the *Aphides* to deposit her eggs, whereas the *Aphidius* punctures the under side for the same purpose.* I cannot refrain from remarking the singular fact, that so few males are found in some species of *Aphides*; and amongst the horny punctured ones, not one of that sex have I detected upon the wheat. Their services are thus rendered more effective, as the prolific females not requiring sexual intercourse for several generations, the destruction of one individual of that sex prevents many thousands from making their appearance in the course of a few months.

The third species of insect I bred does not destroy the *Aphides*, but infests the *Ephedrus*: it belongs to the Family PROCTOTRUPIDÆ or OXYURI, and many years since I described it under the name of

9. *Ceraphron Carpenteri*.† It is black and shining; head and thorax finely punctured and clothed with minute hairs: the *Male* has a broad head; the eyes are lateral; ocelli 3 on the crown in a curved line: antennæ inserted near to the mouth, longer than the body, 11-jointed, geniculated, bristly and serrated, basal joint elongated, second minute, third and five following obtrigonal, the internal angles pointed, the remainder elliptical: thorax obovate, as broad as the head, with three longitudinal striæ; scutellum ovate; metathorax with the hinder angles toothed: abdomen smaller than the thorax, very shining, ovate-conic, depressed, attached by a broad but very short pedicle, composed of seven joints, the first covering more than half the body, the base striated: four wings transparent; pubescent very iridescent; anterior with a thick pitchy costal nervure, terminating beyond the centre in an oval horny stigma, from which issues a longish curved ray: legs pitchy, tips of anterior thighs with their tibiæ and the base of the other tibiæ bright ochreous; tarsi more or less ochreous-brown, five-jointed, basal joint long; claws and pulvilli distinct (fig. 22; d, the natural size). *Female* larger, the antennæ scarcely so long as the body, not serrated nor hairy, but clavate and eleven-jointed (fig. e), basal joint longer than the head, second and third of equal length and slender, two or three following obtrigonal, the remainder slightly oblong, the apical joint conical: abdomen as large as the thorax and acuminate at the tip, composed apparently of two horizontal valves.

I bred one male and several females from the wheat ears, and these select those *Aphides* which have been already occupied by

* Ent. Mag., vol. i. p. 486.

† Curtis's Brit. Ent., fol. 249, and Dissections in pl. 249; Curtis's Guide, Genus 581-7; and Journ. Roy. Agr. Soc., v. iii. p. 59.

the parasitic *Ephedrus* (fig. 21), in whose larva the female *Ceraphron* deposits an egg, and thus the maggot of the destroyer is punished with death in its turn! Here we see a countercheck is provided to prevent the too great multiplication of the legitimate guardian, and thus indirectly the *Ceraphron* assists in preventing the extinction of the plant-lice.

There is a little apterous *Cimex* of a bright scarlet colour, which is frequently very abundant in corn-fields, and appears to me to be the larva only of a species of bug. I expect it lives upon the *Aphides*, or some other of the injurious insects, as in all probability it is carnivorous; but I am at present ignorant of its economy. It is this insect, I apprehend, which Somerville alludes to.* He supposes the Blight, called *hungry pickles* by dealers, to be attributable to insects; but whether the shrivelled appearance of the grain and the empty husks of the wheat, in very wet seasons, be caused by them or by the presence of the blight, named by Dickson *Uredo frumenti*, I am unable to decide; it is clear, however, that Somerville has confounded two distinct insects, as we shall see by his statement. He says it strikingly resembles a louse, being of a bright red colour, soft and tender; it then assumes a dirty black tint, becomes stationary, and continues so till it dies, when it is hard.† In 1782, when the crop was very late, and the season very wet and cold throughout, the wheat crop, he says, almost entirely failed from the depredations of this insect, and it has always been in such seasons that it has been deficient. When the crops have been early they have been least affected, and the plant has attained sufficient vigour before these insects appear, to resist their influence, and if it be the delicate rostrum of the larva that causes the mischief, it would not penetrate the hardened stem, husks, &c.; and, he adds, on such they seemed to die of hunger, or remove from them. After the grain has passed the milky state it is safe from their attacks. Such mischief has always been done to crops not perfectly covered after sowing, or when the seed is very near the surface, while such as are deposited at a greater depth almost wholly escape.‡ From the errors already pointed out it is impossible to draw any correct conclusions from the foregoing observations; it is only from the most accurate data that we can hope to derive beneficial results.

When we found the *Aphides* in August, three other insects were flying over and alighting upon the wheat. I shall allude to two of them briefly in order to direct attention to their economy. One

* Dickson's Practical Agriculture, vol. i. p. 556.

† This is no doubt the punctured *Aphis* (fig. 20. b) which he has confounded with the scarlet bug.

‡ Vide Dickson's Practical Agric., vol. i. p. 556.

was a saw-fly called *Selandria humeralis*,* of which there were several; another was a beautiful little green parasitic fly with black feet, which was running over the ears; it belongs to the family *Chalcididae*, and is an *Entedon*.† The third was so abundant that Mr. Graham took many of them on the wing; and as, in all probability, it lives upon the larva of some insect infesting the corn I will describe it. It is related to the species lately alluded to in this Journal, which is parasitic on the *Chlorops tæniopus*;‡ it consequently belongs to the Order HYMENOPTERA, the Family ICHNEUMONIDES ADSCITI; and forms a portion of the Genus DACNUSA, I believe,§ and being uncertain of its specific name, I propose calling it, from its inhabiting corn-fields,

13. *Dacnusa cerealis*: *Male*, slender, black, and shining; head rather small and subglobose; eyes orbicular; ocelli 3 in triangle: antennæ as long as the body, filiform, composed of 21 joints, pubescent and fuscous, the three or four basal joints bright ochreous, first joint oval, truncated obliquely; second, small, globular; third, long; fourth, and following, decreasing in length: thorax elongated, gibbose before; scutellum rugose with elevated lines, the sides striated; postscutellum rugose, with three elevated lines forming a trident on the back; the pedicle is elongated, narrowest at the base, depressed, striated, and pitchy-brown; abdomen rather short and slender, the apex clavate, brown, excepting the basal joint, which is ochreous-brown, and the belly is of a similar but a paler tint: four wings very transparent, beautifully iridescent, nervures very pale reddish-brown, as well as the stigma, which is elongated; radial cell perfect and reaching to the apex: two complete discoidal cells, all the posterior ones imperfect: legs long, slender, and bright ochreous; tarsi 5-jointed, their tips and claws black: length $1\frac{1}{2}$ line, expanse 3 lines.

CORN-BUGS.

We have now arrived at some insects belonging to the Cimicidæ or tribe of bugs, which are abundant in corn-fields, and probably live upon other insects that injure the crops. Mr. Kirby describes one in the Linnean Transactions,|| which he found very common upon the wheat, in all its states, with the wheat-midge, but he could not discover that it devoured it. The larvæ, pupæ, and perfect insects were at the same time upon the straw and ears; for like the plant-lice or *Aphides*, this tribe is active, and resembles its

* It belongs to the *Tenthredinidæ*, and is nearly allied to the *Athalia spinarum* produced from the Nigger Caterpillar; Royal Agric. Jour., vol. ii p. 364.

† Curtis's Guide, Gen. 620.

‡ *Calinius niger*, Royal Agric. Jour., vol. v. p. 496.

§ Haliday's Hymen. Brit. Fasciculus, ii. p. 5.

|| Vol. v. p. 110.

parents in its larva and pupa states. These bugs belong to the Order HEMIPTERA, the Family COREIDÆ, and the Genus MIRIS of Fabricius. The specific name, owing to its being attached to the wheat, is

14. *M. Tritici*.* *Male*, tawny-ochreous, long and narrow; antennæ longer than the body, inserted before the eyes, setaceous, pubescent and four-jointed, parallel at the base, the first joint stoutest, blackish at the base beneath, forming a stripe outside, second twice as long, third much shorter, fourth the shortest and fuscous; the rostrum is inflected and almost half as long as the body, four-jointed, blackish at the tip: head subovate, the centre a little projecting, and leaving two shoulders for the insertion of the antennæ; it is sulphureous with a deep channel at the base, a large slate-black patch on the crown, and a spot on each side of the base of the same colour; eyes small, oval, lateral, and prominent; ocelli none: thorax oblong, narrowed before, the hinder angles rounded, sulphureous, with two black lines down the centre, and one on either side tapering behind; scutellum moderately large, ovate-trigonal, acute and slate-black, with the edges and a line down the middle sulphureous: abdomen flat, linear, and margined, obtuse at the apex, slate-black above, silky grey beneath: elytra or superior wings coriaceous, considerably longer than the body, linear in repose, pale sulphur coloured, the interior portion brown with a slate-coloured stripe on each near the base, leaving a pale costal margin; membrane fuscous, with an elliptical cell at the base; inferior wings ample, folded in repose, with several faint brown nervures, transparent, very iridescent: hinder legs very long; four anterior thighs spotted with brown beneath; shanks simple, slender, and hairy; feet triarticulate, basal joint the longest and stoutest; second rather shorter than the third; claws slender and simple (pl. O, fig. 14; v. the natural length). *Female* similar to the male, but shorter and broader, entirely of an ochreous tint, excepting the black abdomen, which is conical and ochreous at the apex, with a long suture beneath to receive the ovipositor; the reflexed sides are orange-coloured; the antennæ and legs are a little stouter and shorter.

I have often met with this *Miris* upon grasses in marshes, in the vicinity of the sea-coast, in company with *M. erraticus* † of Linnaeus, of which it may be only a variety.

Another species is exceedingly abundant in barley-fields, and upon the long grasses in flower on their borders. Towards the end of last June there were multitudes of the pupæ and imago in the fields surrounding Wilton and Salisbury: they are, in all pro-

* Curtis's Brit. Ent., fol. and pl. 701, where 12 species are referred to. A figure of the male is represented flying, and dissections are given.

† Brit. Ent., fol. and pl. 701; and Curtis's Guide, Gen. 1099.

bability, carnivorous, and consequently the farmer's friend, but we have not been able to trace their economy to its source. This insect belongs to the same Order, Genus, and Family as the last; and I gave it the specific name in the Guide of *picticeps* from its painted head; but after collecting a series of specimens, I am inclined to believe that it is only a variety of the Linnean species, called

15. *Miris dolabratus*. The *Male* is sulphur-coloured, pubescent: head small, black, somewhat lozenge-shaped, a little narrowed behind the eyes, which are lateral, prominent, oval, and brown; the forehead is a little produced, with a yellow dot on each side of the face, an orange streak on the forehead, and a yellow margin to the eyes above; ocelli none; rostrum long, slender, four-jointed, piceous at the tip: antennæ not so long as the body, setaceous, pubescent, four-jointed, piceous or tawny, parallel at the base, first joint the stoutest, a little longer than the head, second more than twice as long, third shorter, fourth not so long as the first and very slender: thorax trigonate, truncated before, twice as broad as the head behind, orange-coloured before, with two broadish stripes of a purplish colour, black before, leaving a pale lateral margin: scutellum larger than in *M. Tritici*, triangular, orange-coloured at the base with four black spots and two on the disc, the edges being of the same colour; abdomen obtuse, fuscous above, ochraceous beneath, with a brown stripe down each side, leaving the margins ochreous: elytra coriaceous, longer than the body, elliptical, rather broader than the thorax at the middle, lying flat on the back, the disc of a rosy tint, membrane fuscous with a large elliptical cell at the base: legs similar to the last, but not so long; tarsi fuscous at their tips (fig. 16; *x*, the natural length of $4\frac{1}{4}$ lines, breadth 1 line). *Female* shorter and broader, the elytra not longer than the abdomen; antennæ and legs much stouter and not so long as in the male, the pubescence upon them thicker and black; the back of the abdomen and the stripe on each side beneath often of a reddish purple colour; the channel to receive the ovipositor convex and not so long as in *M. Tritici*: length 4 lines, breadth $1\frac{1}{4}$. The *Pupa* is not 3 lines long, boat-shaped, destitute of wings, and of a bright yellow colour; the legs and antennæ are rather stout, and most like those of the female in both sexes; they are ochreous, often clouded with purplish-red; the eyes are black; on the crown of the head is a balloon-shaped figure of a chestnut colour; the thorax has a broad stripe on either side of the same tint, which runs along over each sheath of the wing-cases down to the tail, which is obtuse in the male and ovate-conic in the female, the under-side is variegated with reddish-purple; tarsi only biarticulate; blackish at the tips (fig. 15; *w*, the natural length).

M. dolabratus also abounds on grass, in hay fields, in June, and is to be met with until the month of September: it is sufficiently different from *M. Tritici* in the form of the head, thorax, and scutellum to establish a second section in the Genus *Miris*.

OSCINIS GRANARIUS.

I am also indebted to Mr. F. J. Graham for another enemy to the wheat-crops. It will be remembered that I lately described and figured a fly called *Oscinis vastator*, which hatched from maggots living in the stems of wheat.* A grain of that corn, from its rosy colour, attracted Mr. Graham's attention last summer, and being secured in a box, it produced a little black fly closely allied to *O. vastator*, but it may be distinguished from it by the base of the shank being black, instead of ferruginous; neither is it the *Musca Frit* † of Linnaeus, which I doubt not is a *Chlorops*.

On examining the grain of wheat (fig. 17), I found the farina squeezed out accidentally, possibly in picking it from the ear; it was of a pink colour, and from amongst it protruded an empty shining pupa-case of a rusty ochreous colour (fig. y; 18 z the same magnified): from this had issued a fly belonging to the Order DIPTERA, Family MUSCIDÆ, and the Genus OSCINIS, and as I cannot find it described I shall call it, from its feeding on the grain,

16. *O. granarius*. It is black and shining, with a greenish cast: the head is transverse, semiorbicular; the antennæ are black and orbicular, with a short pubescent seta; the eyes are large, remote, and oval; ocelli 3 in triangle on the crown: the thorax is nearly quadrate; scutellum semiglobose: two wings transparent, iridescent, the nervures dark, and exactly like *O. vastator*; two balancers with a large ochreous white club: legs black; the first pair is lost; four posterior, with the basal joint of the tarsi dirty-ochreous, and tip of the intermediate tibiæ of the same colour. Fig. 19; a, the natural size.

I regret my inability to give any better history of this little fly, but I trust this sketch may lead to a knowledge of its economy, should it ever appear in any abundance. It is moreover interesting, as it shows how insects of the closest affinities vary in their habits of life, and it is only a practised eye that can in many cases detect the differences of allied species.

MILLIPEDES, or False Wire-worms.

Before dismissing the insects attacking the wheat, I must not forget to state, that in November, 1844, I had some plants sent

* Royal Agric. Jour., vol. v. p. 493, fig. 31 to 34.

† Ibid., vol. v. p. 488.

me which had been sown, and had made shoots from half to an inch in length, when they died, owing, it was believed, to their being infested by a *Millipede*, called *Polydesmus complanatus*, which was lately figured and described in this Journal.* There was every appearance of their being the culprits, for they swarmed round the grains, which were much injured, and fast decaying; the only question is, whether they fed upon the grain before or after it became in a sickly state.

VIBRIO TRITICI.

Although neither the *Millipedes* nor the *Vibrio* belong to the same *Class*, they are so intimately connected with Insects, in affecting the crops, that I could hardly complete my subject if I did not include them in this Essay; and as it is many years since the history of the *Vibrio* was published in the 'Philosophical Transactions,'† and that work may be inaccessible to many agriculturists, I am induced to introduce sketches to illustrate its economy from the inimitable drawings of the late Mr. Francis Bauer, deposited in the Banksian Library of the British Museum, and they will prove the more acceptable from Professor Henslow having included the *Vibrio* in his 'Report on the Diseases of Wheat' in a recent volume of this Journal.‡

The minute worm which causes the disease called ear-cockle, or purples, belongs to the Class INFUSORIA, and has been named

17. *Vibrio Tritici*. The eggs are taken up by the sap from the infected grain which may have been planted, and hatch in the stalk § as well as in the germen. The largest worms (fig. 28) are a quarter of an inch long at least, of a yellowish-white colour, and not so transparent as the young worms (fig. 27); "their heads are very distinct; they have a kind of proboscis, which has three or four joints, which they contract or extend like an opera-glass. From the head, which is somewhat roundish, they taper gradually off towards the tail, which is scarcely half the diameter of the middle of their body, and ends in an obtuse claw-like point. At a short distance from the end of the tail is an orifice, surrounded by an elevated fleshy edge; from this orifice the worms discharge their eggs (fig. 29). The back of these old worms is nearly opaque, and appears jointed or annular; the number of joints or rings is from 25 to 30; the belly side is more transparent, and strings of

* Royal Agric. Jour., vol. v. p. 230, pl. J, fig. 55.

† The Croonian Lecture, read before the Royal Society, Dec. 5, 1822, and published in 1823, in their Transactions, vol. i., p. 113, being 'Microscopical Observations on the Suspension of the Muscular Motion of the *Vibrio Tritici*,' by Francis Bauer, Esq., F.R., L.S. & H.S.

‡ Royal Agr. Jour., vol. ii. p. 19.

§ Mr. Bauer thinks this may be another species of *Vibrio*.

ova can be distinctly seen through almost the whole length of the worm to the orifice by which the eggs are discharged." Those in the cavities of the mature grain are generally $\frac{1}{3}$ or $\frac{1}{6}$ of an inch long, milk white, and semitransparent. After laying all their eggs, the parent worms soon die, and in a few days they decay and fall to pieces; but such is not the case at an earlier period of life, for after being dried and appearing quite dead, on the application of moisture they become as lively as they were at first: and thus for five years and eight months Mr. Bauer was able to reanimate the worms by immersion, but it required a longer period as the time lengthened, and after that they died: other examples bred by him retained their revivescient qualities for six years and one month. It seems probable that the glutinous substance in which they are enveloped preserves their vitality. They may be kept alive for three months in water.

It appears from Mr. Bauer's investigations, that the cavities of the grain are at first filled with a white fibrous substance formed by gluten into balls of a silky nature. In water they instantly dissolve, and exhibit hundreds of minute worms, which become animated in less than a quarter of an hour when moistened, and the grains eventually assumed a dark brown colour, and were as hard as wood.

Nothing is known regarding the sexes, and it is extremely probable the *Vibrios* are hermaphrodite. In some grains approaching maturity, only one was found with the cluster of eggs, in others there were three. The eggs come forth in strings of five or six together (fig. 29), and are detached in water: the young worms can then be seen through the transparent skin (fig. 30). In about an hour and a half after the egg is laid in water, the young worm begins to extricate itself, which it took one of them an hour and twelve minutes to accomplish.

Such are some of the leading points in the economy of this extraordinary little animal noticed by Mr. Bauer; and for further information I must refer the reader to his valuable Paper, and to Professor Henslow's interesting Report. The figures we have added to illustrate the history of the *Vibrio* will be found described at the end of this Paper.

Summary of the foregoing Report.

Parasitic flies living upon the wheat-midge, *Cecidomyia Tritici*, and upon each another.

Platygaster Tipulæ, found during summer months, deposits its eggs in the maggots of the wheat-midge. It is exceedingly abundant.

It lays only *one egg* in each maggot, passing by those previously inoculated.

Females in swarms, *males* very seldom seen.

• A second species in corn-fields, called *Platygaster Tritici*; and there is a vast number of other species.

Platygaster? inserens lays its eggs in those of the *P. Tipulæ*, and limits its increase.

Macroglenes penetrans is also occupied in the same way, but lays its eggs in the maggots of the *Platygaster Tipulæ*.

Flies called *Empides* carry off and devour the wheat-midge.

A little insect called *Thrips* accused of injuring the corn-crops.

Some species destroy *peaches* and *melons*, *cucumbers*, *olives*, and hot-house plants.

Thrips cerealium destroyed one-third of the wheat crop in the richest plains of Piedmont in 1805, and it is believed affected the same crops in England.

It causes the *rye* to be unprolific in *Scotland*, and also in *Sweden*.

The *larvæ* and *pupæ* are similar to the perfect *Thrips*, but the first is of an orange colour, the others are black, and the female only has wings in her last stage.

Abundant in summer in the *ears* and between the *leaves*, at the base, in *wheat* and *barley* plants.

It is the most numerous of all the insects infesting the wheat, and common every year.

Pungled, or shrivelled grains, caused by the *Thrips* extracting the milky secretions, and abortion frequently occurs from their piercing the tender straw at the joints.

One fourth part thus destroyed in some ears.

Orange-coloured *larvæ* very active, *pupæ* indolent.

The orange-coloured *powder* often accompanying them is not their excrement, but a *fungus* called *Rust*.

They do most mischief to late-sown wheats, the early-sown being too hard to suffer from their attacks.

Apparently more injurious on heavy than on light soils.

In some years the bearded wheat escaped, in others it has suffered most.

Earwigs with them. Do they live upon the *Thrips*?

Minute as the *Thrips* is, it is infested by a *parasite*, and is often covered with *mites* which feed on it.

Aphides, or plant-lice, called also dolphins, infest the wheat in July and August; when they are in every stage of growth.

Aphis granaria also inhabits *barley* and *oats*.

Every *Aphis* sometimes punctured by a parasite, and the ears exhibiting numbers of brown and black globules scattered over them.

Aphidius Avenæ lays her eggs in the body of the apterous *Aphis*, which then becomes brown.

Ephedrus plagiator deposits her eggs in a similar way in the apterous *Aphides*, which assume a *black* colour.

Very few *male Aphides* to be found, and the *punctured* ones are all *females*.

Ceraphron Carpenteri destroys the parasitic *Ephedrus*, by depositing its eggs in the maggots, which are already living in the *Aphides*.

A little apterous *Bug*, of a *scarlet* colour, abundant on corn. It is *carnivorous*, and possibly lives upon the *Aphides*.

Hungry pickles supposed to be caused by this or some other insect by Somerville.

A fungus, called *Uredo frumenti*, makes its appearance at the same time.

Such mischief arises from *shallow sowing*, according to Somerville.

A saw-fly, named *Selandria humeralis*, an *Entedon*, and *Dacnusa cerealis*, flying about a wheat-field in August; the last in abundance.

Miris Tritici, a bug, abundant on the wheat with the *Aphides*, in the larva, pupa, and perfect states. Does it live upon the plant-lice?

It also abounds on *grasses* in marshes on the *sea-coast*.

Miris dolabratus equally common upon *barley* and the borders of the fields, in every stage, where it is in all probability serviceable in destroying noxious insects.

It is exceedingly numerous in *hay-fields* around London from Midsummer to Michaelmas.

A little fly called *Oscinis granarius* appears to live in the grain of *wheat* in the larva state.

One bred from a *pupa* issuing from a *kernel* of a *rosy* colour.

A Millipede called *Polydesmus complanatus* in abundance about grains of *wheat* which had *vegetated* and *died*.

Were they the cause or effect of the disease?

The worm named *Vibrio Tritici*, infesting the grains of *wheat* in the ear, which are then called Ear-cockles or Purples.

Eggs absorbed from the soil with the *sap*.

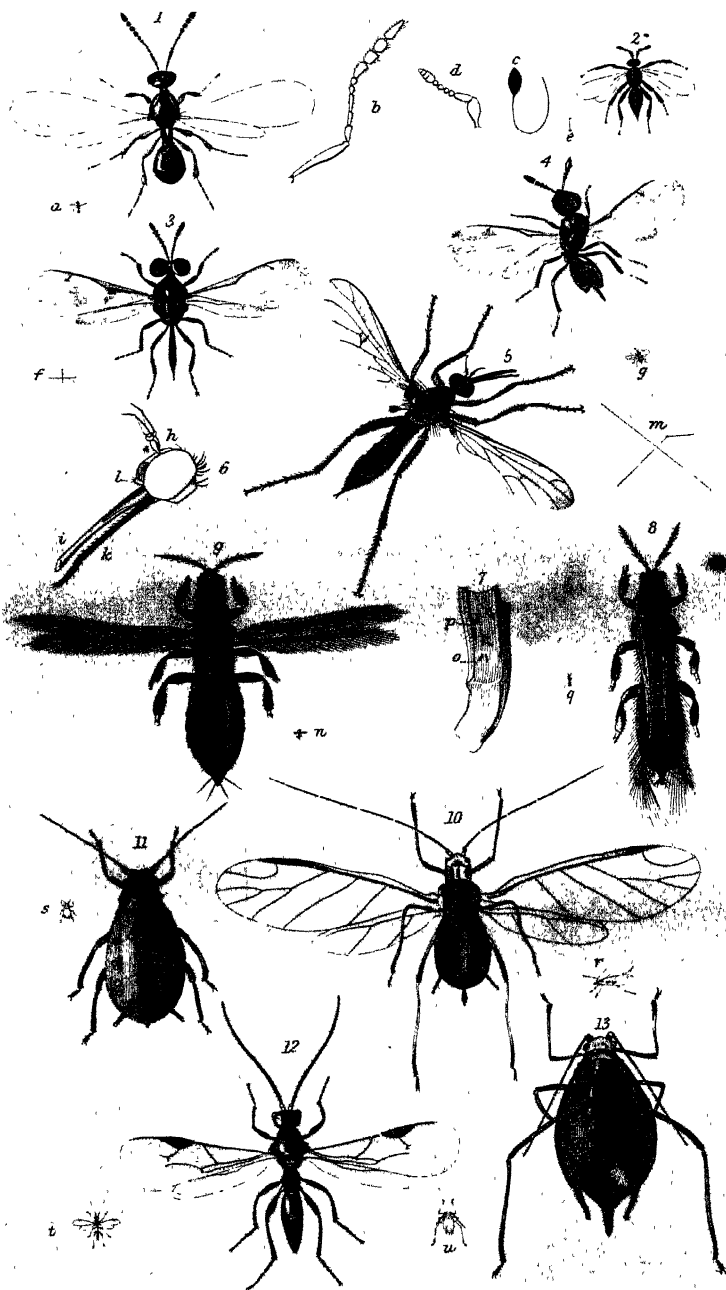
The *female* worm *dies* after laying her *eggs*.

When *dried and dead*, *moisture reanimates* the worms, and their *vitality* has not been *extinguished* for upwards of *six years*.

The *glutinous substance* in which they are enveloped probably secures their *vital* powers from destruction.

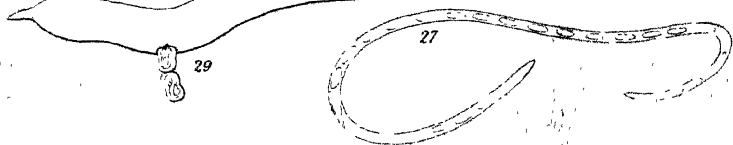
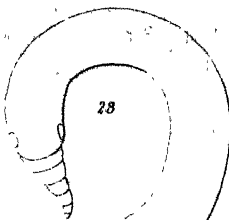
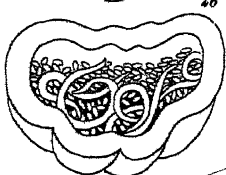
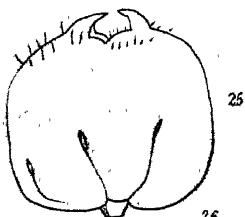
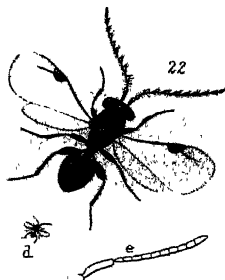
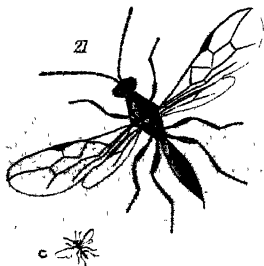
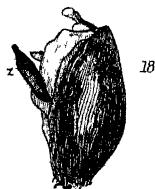
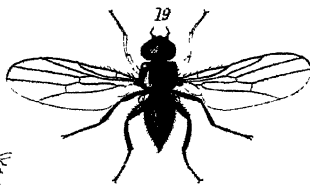
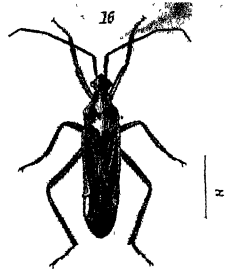
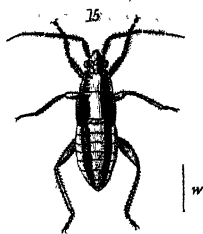
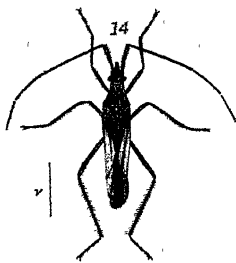
The *cottony substance* which at first fills the *grains* is composed of hundreds of these *worms*, which become active in a quarter of an hour on being moistened.

The *grains* finally become hard and *dark*.



N

J. Edwards del. Oct 1847



They are believed to be *hermaphrodite*.

The more matured grains contain innumerable eggs with from one to three worms only in each.

The *eggs* are laid in strings of five or six together, and the young worms can be seen through the skin.

The *young worms hatch* about an hour and a half after the *eggs* are *laid*, when put in water, and they are almost as long in extricating themselves.

EXPLANATION OF PLATE N.

Fig. 1.* *Platygaster Tipulæ*, male.

a The natural size.

*b** The antenna.

Fig. 2.* *Platygaster inserens*.

e The natural length.

*c** The abdomen and ovipositor.

*d** The antenna.

Fig. 3.* *Macroglenes penetrans*, male.

f The natural dimensions.

Fig. 4.* *Macroglenes penetrans*, female.

g The natural size.

Fig. 5.* *Empis livida*, female.

m The natural dimensions.

Fig. 6.* Head of the same in profile.

*h** The two antennæ.

*i** The upper lip.

*k** The under lip.

*l** The Palpi or feelers.

Fig. 7. Portion of a stem of barley exhibiting

o Larvæ of the *Thrips*.

p The *Thrips* itself.

Fig. 8.* *Thrips cerealium*, female.

q The natural size.

Fig. 9.* The same flying.

n The natural size.

Fig. 10.* *Aphis granaria*, male.

r Natural size, walking.

Fig. 11.* An apterous larva.

s The natural size.

Fig. 12.* *Aphidius Avenæ*, male.

t The natural size.

Fig. 13.* Case of *Aphis granaria*, female, from which the *Aphidius* had hatched.

u The natural size.

PLATE O.

Fig. 14.* *Myris Tritici*, male.

v The natural length.

- Fig. 15.* *Miris dolabratus*, pupa.
 w The natural length.
- Fig. 16.* *Miris dolabratus*, male.
 x The natural length.
- Fig. 17. A grain of wheat.
 y The pupa-case, exerted.
- Fig. 18.* The grain magnified.
 *z** The pupa-case ditto.
- Fig. 19.* *Oscinis granarius*, female?
 a The natural size.
- Fig. 20. A portion of an ear of corn.
 b The punctured Aphides.
- Fig. 21.* *Ephedrus plagiator*, female.
 c The natural size.
- Fig. 22.* *Ceraphron Carpenteri*, male.
 d The natural size.
 *e** Antenna of female.
- Fig. 23. Portion of a full-grown diseased ear of white wheat.
 f The ear cockles.
- Fig. 24.* Transverse section of an infected young germen, from the upper part of a green spiket.
- Fig. 25.* An infected young germen in a more advanced state.
- Fig. 26.* Transverse section of the same, having several large worms, a great many eggs, and some young worms in its cavity.
- Fig. 27.* A young worm.
- Fig. 28.* "One of the largest worms in its most usual attitude, and in the act of laying its eggs."
- Fig. 29.* The eggs coming forth in a series.
- Fig. 30.* "An egg containing a living young worm, twisted and rolled up in its natural manner."

Obs.—Those numbers and letters with a * attached, refer to the objects which are represented larger than life. All the figures are drawn from nature, excepting 2, *c* and *d*, which are copied from the Linnæan Transactions, and 23 to 30 inclusive from Mr. Bauer's drawings for the Philosophical Transactions.

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Hayes, near Uxbridge, Nov. 1845.

XLII.—*On converting a Moory Hill-side into Catch Meadow.*
 By JOHN ROALS, of Brendon Farm, Somersetshire.

PRIZE ESSAY.

AT Lady-day, 1816, I began to farm three hundred acres of land on Brendon Hill, the property of the Earl of Carnarvon, the elevation of which is one thousand feet above the sea; about

two hundred acres were then covered with heath, sixty with fern, and the remainder with peat and moss. Not having hay to give my horses, I began to turn attention to procure some. The first course I took was to take the level from all the springs, and then to ascertain how many acres I had under that level that I could carry the water over; and when I found how much land I could irrigate, I began to cultivate my intended meadow, which was done by paring and burning, and, after spreading the ashes, to break up and work the land to the depth of from 12 to 15 inches with Finlayson's harrow, by stirring the subsoil, but not to bring it to the surface; after working many times over in this way, I got the surface as even as I thought necessary; it was then manured with 60 bushels of lime an acre, and sown with turnips, which were fed off on the land. After the turnips the land was again worked with the harrow, rolled and made fine, and in April was sown with grass seed, harrowed in and rolled. The grass came up well, and was stocked on the 1st of July following with seven sheep to the acre, which it kept in good condition until the 1st of November, when it was again rolled, and the water gutters made to take the water that was drained from the springs above. I set out the watering gutters by the level, giving them 1 inch fall in every 10 feet. They were cut 9 inches wide and 3 inches deep. If the land has a gentle slope, the gutters may be put 60 feet from each other; but if it be very steep, and there is a good flow of water, they may be put seventy or eighty feet apart. When I find the water sink too fast into the land, I spread fine earth or road scrapings over the surface in order to fill it up, that the water may pass over to the next catch-gutter. In this way I made my first 14 acres, which took five years to complete. In the same manner I have from time to time drained all the wet land on the farm, and have now 30 acres of meadow, which yield a crop of hay from a ton to a ton and a half per acre annually.

Where it is possible to carry water over dry land, it is best to do so; but the *bog itself* can be converted into water meadow. I have lately drained a deep peat bog by cutting drains in some parts of it to the depth of 7 feet. This bog was 10 acres; one-half of which is now watered. The way I manage to prevent the flooding water from getting down into the drains is as follows:—I first fill the bottom with flat stones set on their edge one foot; then a foot of stones broken small; on them a 3-inch turf with the grass downwards, and well trodden in; on this turf I lay on puddle, which I bring within 6 inches of the surface. When this is done, I pare and burn, manure, and manage the peat in the same manner as I do the other land.

The water gutters should be cut with the under edge sloping outwards, in order to let the water flow more freely over the land,

and be less liable to be trodden in by cattle or horses passing over them. The water should never be suffered to remain in one place over the grass, more than two or three days at a time, without being changed, nor be turned upon the land in order to remain there during frost; but should the frost set in while the water is on, by no means alter it until the frost is gone; for, if the surface is exposed and the frost continues, it will most likely lift the land and kill the grass. After the hay is made I never stock the after-grass with anything but sheep, or cattle under two years old, feeding it down as close as possible by the 1st of November. I then clean the gutters and roll the land in order to begin watering as soon as the springs *begin* to break in the autumn. *November, February, and March* are the best months for watering.

All the land on this farm was valued under an Inclosure Act in 1804 by the surveyor at 2s. an acre. What I have converted to meadow would now let for 25s., and is still improving. The soil on this farm is part peat and bog, and brown loam resting on gravel, and a soft slaty rock. The fern grows in the brown loam, which on our moors is by far the best land for water meadows.

The sides of the mountains in the north of England and Wales might be converted to catch meadows in the same way that I have done mine, provided the water is of good quality and the land can be made porous to let the water filter gently down. I have never found turning water over old pasture do much good, as the grass that comes up is coarse and thin, and the hay, if mown, is not of good quality. If, therefore, old pasture is intended for meadow, it will answer best to break it up first, work it clean, manure it well, and seed it down with those grass seeds that are most congenial for water meadows.

The first Year's Expense per Acre.

	£.	s.	d.
Paring and burning	1	0	0
Spreading ashes	0	1	6
Working land with Finlayson's harrow, 4 horses	1	5	0
Harrowing and rolling	0	5	0
60 bushels of lime and carriage	2	5	0
Slaking and spreading lime	0	3	0
Turnip seed	0	2	0
Drill and harrowing in seed	0	3	0
Hoeing turnips	0	5	0
	5	9	6
Value of turnips	3	3	0
First year's outlay	£2	6	6

Brought forward . . .	£2 6 6
<i>Second Year.</i>	
Cultivating after turnips . . .	0 10 0
1 bushel of rye-grass seed . . .	0 5 0
12 lbs. red and white clover, 10d. . .	0 10 0
6 lbs. rib-grass seed, 4d. . .	0 2 0
Sowing and harrowing in grass seeds . .	0 2 6
Making water gutters . . .	0 10 0
2 years' rent of land . . .	0 15 0
	<hr/>
	£5 1 0
To keep of 7 sheep from 1st July to the 1st November, 16 weeks, at 8s. each	2 16 0
	<hr/>
	£2 5 0
After-grass	0 5 0
	<hr/>
Total expense of converting a waste mountain-side into water-meadow	2 0 0

The reason I did not plough the land after the ashes were spread, was that I wished to keep the vegetable matter that was on or near the surface from getting down to mix with the subsoil.

JOHN ROALS.

Brendon Farm, Wiveliscombe, Somerset, 1845.

Notes.

I have known Mr. Roals's farm for many years. It stands alone on the summit of the wild Exmoor range of mountain land. If any one asserted that, for a trifling outlay, he could enable heath-covered steepes to rival in produce and value the old grazing grounds of Northamptonshire, he would be regarded as a dreamer. But if any owner of moors will visit West Somerset or North Devon, he will ascertain the literal truth of the statement, as I did five years ago. All that is required is a streamlet trickling down the mountain side, or a torrent descending rapidly along the bottom of the glen. The profit of underdraining old arable land appears trifling, when compared with the profit of thus forming catch-meadows, which, according to Mr. Roals, is more than one pound interest for two pounds invested. The two pages of this Prize Report, which state no more than Mr. Roals has himself done, contain a talisman, by which a mantle of luxuriant verdure might be spread over the mountain moors of Wales and Scotland, of Kerry and Connemara. If the plain means of improvement and employment are still neglected, it will be impossible not to tax the owners of those needless deserts with supineness; and difficult to deny that they hold in their hands more of this country's surface than they are able to manage for their own good or for the good of the community.

PH. PUSEY.

The water-meadows at Audley End were formed in 1841, *from old pastures without disturbing the surface* except for the purpose of adjusting the levels and cutting the ditches; but in consequence of the inequality of the ground many hollow places were filled up with fresh moulds, and the produce was not much increased the first year of irrigation.

Although it was not possible to ascertain the exact amount of the crops for the succeeding three years, two of the three crops grown in each season having been consumed in a green state on the ground, yet occasionally single rods taken indiscriminately from the first growth of grass have been weighed, to obtain a tolerable estimate of the general produce, and affording the following result:—

First Time of Cutting.	Weight of Grass per Rod.	Weight of Hay per Rod.	Weight of Grass per Acre.		Weight of Hay per Acre.	
1843.	lbs.	lbs.	Tons.	Cwt.	Tons.	Cwt.
May 1st	143	39	10	4	2	15
May 30th	201	51	14	7	3	12
1844.						
April 22nd	152	38	10	17	2	14
May 15th	211	62	15	1	4	8
1845.						
May 23rd	170	44	12	2	3	2
June 3rd	218	56	15	11	4	0

In the end of July and beginning of August, 1844, a second cutting was made of the grass growing on the land above referred to, and carried to the homestead in a green state for consumption, and this crop appeared nearly as heavy as the first.

It must be noticed that no deduction has been made for any waste of ground arising from the carriers or troughs; but it may be presumed, after allowing for this loss of surface, that the average produce yielded the three last years has been about 31 tons of grass, or 8 tons of hay per acre.

It appears from the different periods of the year at which the crops arrived at maturity, that even on irrigated meadows the temperature of the atmosphere in the early part of the spring exercises considerable influence over the growth of the grass, where water is not always at command to apply to the meadows.

Italian rye-grass seems suitable for irrigation, as a patch at Audley End measured 3 feet 2 inches in height on the 30th of April, 1844.

BRAYBROOKE.

XLIII.—*On the Cultivation and Preparation of Gorse as Food for Cattle.* By SANDHAM ELLY.

THE following circumstance first brought the cultivation of gorse as food for cattle under my attention.

A very poor man, the ranger of an extensive wood, and also holding a small farm near my grounds, had but one horse to do all the business of his farm. This unfortunate animal was worked six days in the week on the farm, and even "Sunday shone no Sabbath-day to him," for he had to draw the family to the parish chapel, some miles distant.

Being quite unused to the luxury of hay or oats, he notwithstanding showed good condition, high spirits, with a fine and glossy coat. This anomaly created an inquiry into the system of feeding practised by the farmer, which was found to be one feed of boiled potatoes daily, and pounded gorse without limitation. This was his food for the winter; in summer he grazed in the woods.

It occurred to me, that as a horse and a cow lived much on the same diet, the food that would fatten a horse could not be very bad for a cow; and having heard that in Staffordshire gorse was extensively cultivated, I crossed the Channel, in the year 1836, for the purpose of obtaining information on the subject, but did not obtain admittance into any of those establishments, save one, that of Mr. Greysbroke, situate on the borders of Worcestershire, who was polite enough to take me over his farm, and gave me much information. He had thirty milch cows, a bull, and six very large farm horses, all in high condition, and exclusively fed on gorse, with the exception of one feed daily of a cooler diet, gorse being considered too rich a food for constant feeding. Neither hay nor oats given to cows or horses. This very flattering picture caused me to commence immediate operations, the result of which I shall give under the different heads, as laid down by the Royal Agricultural Society.

1. *Quality of the Land where the Gorse is sown.*

My grounds are situate in the county of Wexford, bordering the county of Kilkenny, some parts so hilly that they are called the Apennines; the soil is six inches deep, of good quality, sub-soil shingle.

My first experiment in sowing gorse seed was in 1837, on a flat field of four statute acres. I sowed the field with Chevalier barley, and then put in the gorse (20 stone to the acre) under the harrow, as we sow clover-seed, and rolled it. The barley came up very well, and the gorse very partially, part of the seed not appearing for six months, while some appeared in ten days. The summer

came on wet and stormy; the barley grew to the height of five feet, became lodged, and smothered my entire crop of gorse. Having broken my leg in fox-hunting, I lost the next year. In the spring of 1839 I sowed an acre of the steepest hill on the Apennines; and, to avoid my first error, it was unaccompanied with any other crop. The gorse came up very partially, and the weeds very luxuriantly, smothering all the late-growing plants. Weeders were set to work, and many of the remaining plants fell a sacrifice to their carelessness, which caused this year's experiment to be nearly a failure; and not having any person to seek instruction from, I was greatly disheartened, but did not despair. In 1840 I sowed the south side of another hill in drills, for the purpose of careful weeding. The seed came up most partially, a great portion not appearing until autumn, and a severe winter coming on, the late plants perished, leaving about half the ground bare. In the autumn I purchased 70,000 seedling plants, at 6*d.* per thousand, which I dibbled in to fill up the vacant space: those plants succeeded very well, and completed the plantation. The following spring I put the ground intended for the plantation under early potatoes, and sowed the gorse in a bed in the kitchen-garden. The potatoes were ploughed out in September, when I had the ground cleanly picked and rolled, that the scythe might work as near the ground as possible. I dibbled in the plants from the seedling bed in rows six inches asunder, and the plants six inches apart in the rows; thus the whole ground was covered with plants six inches apart every way. This system I have continued with success, not a plant having missed, and the ground looks well covered. I must here observe, that to make success sure the plants must be in the ground, if possible, in September, but not later than November, or their succeeding will be very doubtful.

I am now (March, 1845) sowing a bed of gorse seed in the garden, for the purpose of adding a couple of acres next September, having so well succeeded in the transplanting system. A statute acre of ground, when planted with seedlings six inches apart, takes 174,240 plants. A pound of seed, allowing two-thirds to come up, will produce 50,000 plants, therefore 4 lbs. of seed will be ample for an acre of ground. In the broadcast system I have, with bad success, sowed 28 lbs. to the acre, the cost being 1*s.* per pound, making a saving in favour of transplanting which will more than pay the expense attending it; besides, the value of the early potatoes should exceed 20*l.* To insure a regularity in coming up, I steep the seed four days, and then allow it to remain in a heap for a week or ten days, to insure regular vegetation before sowing, keeping the heap turned every day, to prevent fermentation.

There is a prevailing but most erroneous opinion, that "the worse the ground the better for gorse," and that even in yellow clay it flourishes. This opinion arises from its great liability to be smothered with weeds, which will not grow in yellow clay or bad ground. I tried the experiment to convince my steward, and planted some seedlings in very bad ground and others in a rich bed in the flower-garden. Those in the bad ground in the second year attained the height of 18 inches, while those in the garden arrived to the height of 3 feet. The seed, steeped as directed, I had sown late in March, and it is now (23rd April) all above ground.

2. The Age of the Plant when cut.

The plants transplanted in September I commence cutting in the October of the following year. Many persons allow gorse to become two years old before cutting, and, with a billhook, cut every second year, and afterwards cut off the side shoots for food. I very much disapprove of this plan—first, because the plants at two years old have lost their rich and succulent quality; and, secondly, on account of the great expense attending it.

3. The Mode and Expense of Cutting.

Cutting (yearly) is very cheap and simple; it is performed with a scythe of the common description. One man in an hour will mow a sufficient quantity for the daily support of thirty head of cattle.

4. Mode and Expense of Preparing.

Horses, being provided with teeth in both upper and under jaws, do not require to have the gorse so finely prepared as that intended for cows. From October until January the young plants are both rich and succulent, and, for horses, only require to be passed through the chaffing machine; but after January they become more dry, and require to be bruised under the stones after passing through the chaffing-machine. In the month of April gorse comes into blossom, when it becomes bitter, and will be rejected by both cows and horses. Cows, being ruminating animals, swallow their food whole, and afterwards bring it up again from the stomach to the mouth for the purpose of mastication. If the thorns are not well bruised they would produce inflammation in the passage, and instinct would cause the animal to reject it; therefore it is first passed through the chaffing-machine, and afterwards bruised under the stones, until it assumes the appearance of moss.

Cows fed on gorse require to be confined to the stall. Those

not used to it will at first refuse, but after a little starving will prefer it to any other food.

5. The Mode of Feeding with Gorse, and the Quantity of other Food given.

Horses eat it with great avidity and thrive well on it. I give each working horse a bucket of prepared gorse in the morning before going out; at dinner time a feed of boiled potatoes, and at night two buckets of gorse; neither hay nor oats. Cow feeding is different; at daylight in the morning the cattle are driven from their stalls to water, if possible a running stream; gorse, if crushed over night and allowed to lie in a heap, would ferment before morning; the cattle are therefore supplied with a feed of mangold-wurzel while the gorse is undergoing preparation; after breakfast (ten o'clock) they get a feed of gorse, as much as they will eat (should any remain in the trough it is taken away); another feed at two o'clock; at four are again driven to water; and at six get a large feed to last all night. Cattle will not eat as large a bulk of gorse as of other food, it being so rich that a less quantity suffices. A square perch of ground (Irish measure 7 yards) planted with gorse, as previously mentioned, gives *my* eight head of cattle their daily food, the cutting and preparation of which will occupy the time of a man, a boy, and a donkey for three hours; one hour to cut, carry home, and pass through the chaffing-machine, and two hours to crush under the stones.

Gorse after being once established requires neither tillage, manuring, nor weeding, producing the most nutritious food without imparting any unpleasant flavour to the milk, which is rich and creamy. Twenty statute acres of gorse should support 100 head of cattle for the winter six months, without any other food save the morning feed of mangold-wurzel, turnips, or potatoes: the saving of hay for 100 cows would be at least 200*l.* per annum.

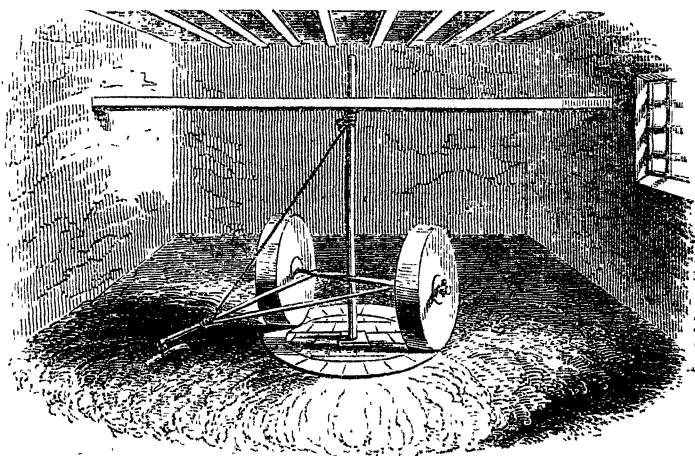
Concerning the construction of machinery for preparing the food much is to be said. Mr. Greysbroke's machine consisted of two metal rollers of great weight, turning on a bed of metal, worked by a horse with the same description of machinery as that used for turning threshing-mills; the cost is about 60*l.* The only objection is the expense; which a needy farmer cannot afford.

Mr. Whitney of Old Ross, in the county of Wexford, makes use of a machine having cylinders and knives, on the principle of a chaffing-machine, and attached to the machinery by which his threshing-mill is worked. This concern stands in 70*l.*, is worked by a pair of horses, and does its business right well.

Mr. Cliffe, of Bellvue, in the same county, uses a machine

something on the same principle, turned by a powerful water-wheel, and reduces the gorse to the substance of moss. This machine is expensive; and few farmers have the advantage of water power.

The machine which I have constructed, a sketch of which is here inserted, consists of two heavy millstones, working on a cut-stone bed, and turned by a donkey; it is of the simplest construction, and cost me 8/.



The gorse, after passing through the chaffing-machine, is heaped on the centre of the stone bed, and raked under the stones by a man who continues walking round and rakes it off as finished.

Gorse is indigenous to Ireland in the hilly parts; a field allowed to remain untilled for five years would become covered with this plant; but Irish gorse is not as good or luxuriant as the French. The farmers in my neighbourhood are now coming into the practice of shearing their gorse fences and preparing it as food for cattle, which has been attended with good effect.

Impressed with the importance to agriculture in general, but to the small farmer in particular, of introducing a crop which enables him to feed eight milch cows off the same space of ground that supported but one by grazing, I have endeavoured to give publicity to my experiments, and spread the system as much as possible. The following fact will prove that my exertions were not in vain. The farmer whom I mentioned in the introduction, at the time his horse attracted my attention, was a very poor man, with difficulty supporting one cow by grazing; having adopted the practice of shearing and bruising the last year's

growth of the gorse forming the underwood of the woods to which he is ranger, he has now a dairy of eight cows, which yields a profit of 100*l.* per annum, thus starting from poverty into comparative wealth. Being the first person in Ireland who attempted gorse feeding with milch cows, or cultivated it as a meadow, I laboured under great disadvantages, not having any person to apply to whose experience or advice might be useful, but I am now happy to say that many gentlemen are adopting the system with the desired effect.

Mr. Cliffe of Bellvue, in the county of Wexford, supports about fifty head of young cattle and many horses by shearing his gorse fences and an extensive fox cover. He lays down the manufactured food at an expense of 4*s.* 9*d.* per ton.

Mr. Crook, of Derreen, in the county of Cork, has 14 acres laid down under gorse, and an English gentleman has ordered 100 acres of his estate in the same county to be laid down in like manner, and I fondly hope that such examples may be followed up by the resident gentlemen of Ireland, as the poor farmer cannot afford the risk of experiments.

Elly Walks, County of Wexford,
23rd April, 1845.

Note.—Furze has been long recommended, and partially cultivated, on poor soils, chiefly as a food for horses. During the Peninsular war our cavalry was mainly supported on it in the passage of the army from the North of Spain into France; and in the Agricultural Report of Mid Lothian (App. No. VI., p. 56) is the following statement:—

“An acre of whins, or furze, has been found sufficient for six farm-horses for four months, with one feed of corn per day, and whins; being in as good order as when fed on two of corn and straw; so that the whole of the straw and one feed of oats were saved, and valuing these at 7*d.* per day for each horse, the saving in 17 weeks amounted, on the six horses, to 17*l.* 17*s.*, from which deducting 5*s.* a-week, as the expense of cutting and bruising, there would remain 13*l.* 12*s.* as the product; but, as the plant requires two years for its growth, 6*l.* 16*s.* is the yearly value.”

The expense of machinery appears to be unnecessary, as a common heavy grindstone, turned on an axle by a donkey, is a sufficient bruising mill, of which there is an engraving, with a detail of the cost and charges, in the ‘History of British Husbandry,’ vol. i., p. 134.—FRENCH BURKE.

XLIV.—*Experiment on the Action of Dung, and of some Artificial Manures, upon Beet-root.* By PH. PUSEY, M.P.

BEING desirous to try the comparative effects of certain manures for my own guidance, I made an experiment upon 5 acres of mangold-wurzel—or beet-root, as it would be more convenient to call that root. There were several questions to which it seemed

to me that the answers, if I could obtain them, would be interesting, and might be useful. To what degree, for instance, one may increase the dressing of dung, with corresponding benefit to the crop, and what is the limit beyond which an increased quantity of dung ceases to act, or again, whether it be better to dress with dung only, or with a combination of dung and of artificial manure. The latter question is the more practical, because some writers maintain that a farm ought to supply its own manure, and that the purchase of artificial aids is a proof of imperfect management. In order to investigate these and other points, I applied to 5 acres of yellow globe beet-root, in the first week of April, different dressings at the following amounts per acre:—

	Dung.	Artificial Manure.
Lot 1.	26 loads of good dung.	
2.	13 ditto ditto.	
3.	13 ditto and .	. 7 cwt. rape-dust.
4.	13 ditto and .	. 14 bush. bones.
5.	13 ditto and .	. 7½ cwt. rags.
6.	13 ditto and .	. 3 cwt. guano.
7.	. . .	. 7 cwt. rape-dust.
8.	. . .	. 14 bush. bone-dust.
9.	. . .	. 3 cwt. guano.
10.	No manure.	

Having found that when manures are tried by being spread upon distinct portions of the same field, some uncertainty is cast upon the result by differences in the crop, which evidently do not arise from the action of the respective manures, but from variation in the depth or quality of the soil, from previous manurings, from the depredation of insects, or some cause that cannot be detected, I apportioned the manures to be tried in a new method, which increased the trouble indeed, but which I thought would make the result trustworthy. The rows were opened 3 feet apart upon the whole piece. In three rows I put the heavy dressing of dung; in the next two rows, the lighter dressing; in the two following rows we added rape-dust to the dung; and so on until, in 19 ridges, all the trials had been prepared. We then began again as before with the heavy dressing of dung, and completed another set of 19 ridges like the first. The extent of 5 acres allowed 6 sets thus to be made; which might be regarded as six repetitions of the same experiment, and as therefore deserving greater confidence. Thus the rows which received artificial manure only, of whatever kind, were of a darker green than the rest until some hot weather came in August. Their leaves then blistered, and many of the leaves withered suddenly off. If this had occurred on one patch of ground only, it might have

been imputed to accident; but no one who saw it repeated on these particular rows, in six different stripes across the field, could doubt that it was caused by the absence of dung, which on such sandy land thus appears necessary for carrying a crop through to harvest. The land, as I have said, was very light, being in part a shifting sand, so that in one part the seed was blown out of the ground; but the dripping summer was favourable, and the crop was a very good one.

At the end of October the roots were taken up, and the produce ascertained by weighing the yield of half an acre, measured across the six sets of rows at one end. The yield was as follows:—

No.		Dung.	Artificial Manure.	Tons of cleaned
				Roots, per Acre.
1.	26 loads	.	.	28½
2.	13 loads	.	.	27½
3.	13 loads		7 cwt. rape-dust	27
4.	13 loads		14 bush. bone-dust	26
5.	13 loads		7 cwt. rags	36
6.	13 loads		3 cwt. guano	36
7.	.	.	7 cwt. rape	20½
8.	.	.	14 bush. bones	20
9.	.	.	3 cwt. guano	20½
10.	.	.	.	15½

By comparing the two first lots, it appears that in doubling the dose of dung we had gained only 1 ton per acre, which is in fact gaining nothing. It is proved, therefore, that on some land, though poor, if in high condition, there is a point beyond which even a large increase of mere dung ceases to act. But the clearest mode of examining the result of the trial will be to divide the lots into classes, according to the amount of produce, and it will be found that they fall easily into classes—an agreement which can hardly be accidental, and leads to the belief that some uniform causes have been at work.

First we must of course take the soil in its actual state, not its natural state, for it is naturally poor, but in its then state of productiveness as it stood without further assistance.

Soil unmanured. 15½ tons of field-beet.

This will of course form the standard by which to judge the effect of the other manures. The artificial manures evidently follow next, their produce running very even. Rags used singly were accidentally omitted from the trial, but having used them in the same field and seen their yield, I should put them at the same amount with the rest.

The second class then will stand thus:—

Artificial Manures alone.

	Tons.
7 cwt. rape	20½
14 bushels bones	20
3 cwt. guano	20½
7 cwt. rags, (<i>estimated</i>) about	20

The agreement, by actual weighing, between the three first artificial manures is very close. The effect of all is but weak, and the increase of crop would barely pay for their use, being only 5 tons, worth about 50s. to consume on the land.

The third class evidently marks itself out as follows:—

	Artificial Manure.	Tons.
13 loads dung		27½
13 loads dung	7 cwt. rape-dust	27
13 loads dung	14 bushels bones	26
26 loads dung		28½

These amounts again may be taken as practically the same. No advantage is gained by exceeding the single dressing of dung. It seems a confirmation of the inference that there is a limit to the profitable use of dung, to find that bones and rape-dust, each efficient when used alone, fail equally with the additional dose of dung in raising the produce above the standard amount, in which there certainly is a striking agreement between the four lots. In the second class, then, the artificial manures gave each about 5 tons additional produce per acre. In the third class, the single dressing of dung gives about 12 tons, which is not increased by the further use of bones, rape, or sensibly even by doubling the dung.

The remaining class shows a different result:—

13 loads of dung	7 cwt. rags	36 tons
13 loads of dung	3 cwt. guano	36 tons

Here we obtain a very large increase by adding two different artificial manures separately to the full dose of dung. The question arises, why these two manures should act so much better; a question I am unable to answer. But in the interesting work on 'Rural Economy,' which Boussingault has lately published, and Mr. Law has translated, there is a very copious table in which the value of manures is stated according to the quantity of azote which they contain. In that table the manures we are now dealing with stand thus:—

	Azote.
Rape-dust	5½
Bones	6½
Best guano	15½
Woollen rags	20½

Possibly therefore a chemist might find the answer in this superabundance of azote, but I am not competent to say how this may be. In fact the two leaders in agricultural chemistry, Liebig and Boussingault, are at variance on this very point. The two principal results of the experiment seem to be—one, that there is on some soils a limit beyond which an additional dose of dung is of no use. This result, if confirmed, would be interesting in theory. In actual farming there is not much danger of our erring in that direction, as to our dressings of dung; and in some parts of the country this would not, perhaps, be a very safe doctrine to dwell upon. The other inference, a more practical one, is that it is more profitable to use some artificial manures in conjunction with dung, than to use either singly. Thus guano and woollen rags used singly, added to my crop only 5 tons per acre. The single dressing of dung added only 11 tons, and doubling that amount of dung did no good; but guano combined with the same amount of dung, and rags combined with the same amount of dung, each gave an addition not of 16 tons of roots, according to their effects when used singly, but of 20 tons, yielding each 36 tons, a produce very large indeed for land which, four years ago when I took it in hand, was said to be incapable of growing a turnip. I will only add, that I am not insensible to the risk, in drawing general rules, from single experiments, however carefully made; but as this experiment was a careful one, I state what appear to me to be the legitimate inferences from it, in the hope that they may be confirmed or refuted by other observers, so that at last the truth may be known.

Pusey, November 24, 1845.

XLV.—On the Nature and Causes of the Decay in Potatoes.
By Dr. LYON PLAYFAIR, Consulting Chemist to the Society.

LECTURE I.

ON former occasions I have ventured to address you on the connexion between practice and science, and you bore any practical ignorance which I might have manifested in the belief that I was anxious carefully to cull the fruits of your experience, and to select them by the light which I had borrowed from the brilliancy of those philosophers who by their discoveries have made mankind their debtors.

I always contended that practice was so much in advance of theory, as far as related to agriculture, that it was the duty of the scientific man not to diverge into "pastures new," but to endea-

vour to elucidate those laws of nature which have enabled you to attain the beneficial results of your present practice.

In describing to you the operation of these laws, I think you were enabled to see that science might be useful to practice by showing the principles upon which it went, and by enabling it to apply those principles in the most direct manner. It was only this direct bond between us that enabled me to dare to stand before an audience composed of practical farmers. But now I come before you in a very different attitude, and it is this difference which I wish you to feel before I begin the subject which we have met to consider. God has been pleased to inflict upon this country a great calamity; a disease has attacked and rendered useless a considerable quantity of one of the staple articles of food of our population. The disease is unprecedented in its extent, has to a great extent baffled the skill of the most eminent *savans* in Europe, and leaves us in a sea of perplexity with regard to its future course. Science looks on, not helpless, but deploring the small amount of aid which it has been able to afford; experience there is none—and practice without experience has no existence. How then do I stand before you? To tell you what is known; to point out to you general principles which may have proved most useful in the mitigation of our misfortunes, and to implore you to use the limited means which science does offer in relieving the exigencies of the case, and in exercising all the precautions which human forethought and industry may employ to prevent the occurrence of such a calamity in a future year—to profit by the knowledge of the present for our guidance in the future.

It cannot be uninteresting to recall to our recollection the manner in which the potato became introduced into this country, and how it has gradually made itself so indispensable to a large portion of our population. It is known to be a native of America, for it has been found growing in a wild state in Chili by English travellers. Its introduction to this country is generally ascribed to Sir Walter Raleigh; but historians are now pretty well agreed that a slave-merchant called John Hawkins had taken over potatoes to Ireland in 1545. It was cultivated to a limited extent till 1590, when it is known that potatoes were introduced into Belgium from Ireland. However, the cultivation must have been very limited, for when Drake, in 1586, brought over a supply to Sir W. Raleigh,* it was supposed to be a new introduction. In fact even then it was a mere chance that they were not entirely forgotten. Sir Walter planted them in his garden at Youghal,

* It is not quite certain whether Sir W. Raleigh himself brought over the potatoes, or whether Drake did so in returning with the distressed colonists of Virginia.

and seeing them in apparently good condition, he told his gardener to send him a dish. It is related that the gardener plucked the green apples, which were sent to Sir Walter's table, who, finding them very disagreeable, was convinced some weeds had been sent instead of the fine American fruit, so he directed his gardener to weed them out of the garden. Whilst doing so the tubers were observed by Sir Walter, who immediately recognised them and directed their future cultivation. Still they got slowly on. Nor could they have been extensively used long after this, for Girard in his 'Herbal' describes the potato as "a plant from America which is an excellent thing for making sweet sauces, and also to be eaten with sops and wines."

In 1684 the plant was pretty extensively cultivated in Lancashire, but it was not till 1728 that the first field-crop was cultivated in Scotland, and it was not extensively grown in that country till 1732. In Scotland the potato met with virulent hostility by the religious zealots of that time, who argued that it was a sinful plant because it was nowhere mentioned in the Bible. Since these periods it is needless to describe to you how rapidly the culture of the potato has spread in this country, or how essential it now is to a large portion of its population.

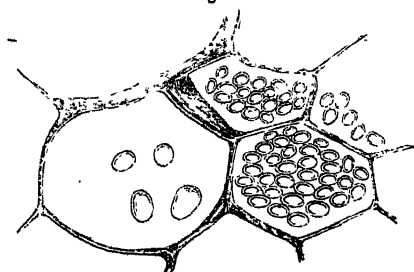
The potato-plant, or, as it is called by botanists, the *Solanum tuberosum*, belongs to that order of plants of which you may take deadly nightshade as an example. The potato itself is vulgarly supposed to be the root of the plant, and fifteen or twenty years since even botanists themselves seemed inclined to consider it as a root. If a seed of the potato is planted, it puts forth roots like any other seed, but these roots never enlarge into a tuber. The tuberous enlargement called the potato is in fact part of the underground stem of the plant, which enlarges into this form by the increase of the cellular tissue. The potato, like all other plants, is made up of three parts—the cellular tissue, the vascular tissue, and a kind of cuticle or skin. Now the enlargement of the underground stem is effected by the great growth of the cellular tissue, while the skin is capable of extension to a certain extent so as to admit of the enlargement.* The vascular tissue (*vide* Fig. II.) does not however increase except in the vascular bundles becoming longer and extending themselves throughout the cellular part; that is, they do not increase in their number.

The cellular tissue is that to which we have to devote more special attention as far as regards the direct subject of the lectures. A number of cells of very various shapes are thrown irregularly and apparently indiscriminately the one upon the other; they are

* A very elaborate memoir on this subject, by Turpin, will be found in the nineteenth volume of the "*Mémoires du Muséum*," page i.

of a somewhat spherical shape, and are composed of a mucous substance, which is white and transparent (*vide* Fig. I., in which

Fig. I.



the cells are darkened to represent the disease). Within these cells are placed other little globules which measure usually about the $\frac{1}{16}$ of an inch in diameter. These little globules are the starch or fecula of the potato. They are of different sizes and shapes, but they may be compared to the form of a flask. These globules of starch are made up of concentric layers—that is, one layer laid upon another, and at one part of each globule is the hilum or point of attachment to the walls of the cell, from which they become detached as others are formed.

The physiologist contents himself with the anatomical examination of the potato, and the chemist then comes to tell us more minutely about the ingredients contained in it. It is a thousand pities that they have not gone hand in hand in their examination. Their combined knowledge tells us that the little globules in the cells consist of starch; but then there are many other substances in the potato to which we do not know where to assign a habitation. For example, there is sugar; but we are ignorant of its exact position in the tuber. Reasoning from what is known as to its position in other vegetables, we must assume that it likewise is situated in cells. Then there is albumen, the same as exists in the white of an egg: this probably also is contained in the cellular sap, and sometimes cheese is also to be detected therein, according to the statement of Liebig. Gluten, the same as that in corn, also exists in the potato; and this being insoluble, is doubtless placed as it is in the cereals, to aid in forming the cellular tissue. Gum is also present: perhaps along with the sugar it may be in solution in the cellular water surrounding the globules of starch. Starch is undoubtedly the most important constituent, and that which is truly the characteristic of the potato. The tuber may, as an average result, be viewed as composed of 74 lbs. of water, 8 lbs. of skin and fibrous matter, 16 lbs. of starch, and 2 lbs. of

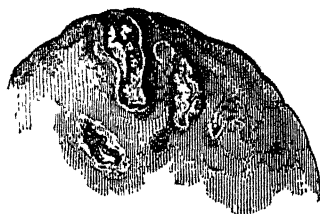
gluten; so that, out of 26 parts of dry matter in the potato, 16 parts are of starch.

Various proximate analyses have been made of the potato, the composition of which, of course, varies according to its variety. The two following analyses exhibit the composition of two varieties examined:—*

	Henry.		G. Phillips.
Pulp . . .	6·8	. . .	3·2
Starch . . .	13·3	. . .	15·9
Albumen . . .	0·9	. . .	2·1
Sugar . . .	3·3	. . .	0·7
Fat . . .	0·1	(Gum)	1·3
Acids and Salts	1·4	. . .	1·3
Water . . .	74·2	. . .	75·5
	<hr/> 100·0		<hr/> 100·0

So much for the healthy potato. Now we come to the consideration of that which is diseased. I have already told you that the tuber is merely an enlargement of the underground stem; so that, of course, it is connected by a subterranean unenlarged stem with that which is above ground. Now, at the junction of this subterranean stem with the tuber the disease generally commences; it extends from this point, following the course of the vascular bundles through the cellular tissue to the other eyes. The characteristic of the disease is, that it attacks and destroys the cell-walls of the tuber; the walls of the cells become irregular, present a ragged, granular appearance; finally, they yield entirely to the destructive influence, the cellular structure disappears, and the starch globules which were within them float in a semi-fluid mass of putrid matter. During the progress of this decay the walls of the cells acquire a reddish colour, then a brown, and

Fig. II. Representing the destruction of the cells and progress of the disease.†



* Several analyses give more minute details, and indicate the presence of citric acid and other substances; but these are unnecessary for our present purpose.

† For this drawing I am indebted to Mr. Henfrey, botanist to the Geological Survey of the United Kingdom.

finally, a black or brownish-black colour. When the potato has become much diseased, fungi are observed to grow on the diseased parts, and they send their mycelium, or spawn, through the cellular tissue, and emit abundance of sporules, or germs, which afterwards produce other fungi. I wish you distinctly to understand that these fungi do not appear at first, and when they do appear it is only on the surface, or on cavities leading to it.

The appearance to the eye and to the senses you know, unfortunately, too well to require description: the brightness of the surface becomes destroyed, and the part discoloured, sometimes of a reddish colour, brown, or black. The disease makes its way from the surface to the centre of the tuber, running often into the malignant gangrenous form, when the entire structure disappears, and the whole becomes a putrid slimy mass of a disgusting odour.

Now, what are the chemical changes which ensue in the potato? In the first stages it is difficult to follow them, except by an ultimate analysis. In the ultimate analysis of a healthy and diseased part of the same potato, the disease being in the first stage before the formation of fungi, the only material difference is in the diminution of nitrogen.

The albumen and the gluten must, therefore, have been decomposed. This is found, in after stages of the disease, by the distinct smell of ammonia, which is always a product of the decay or putrefaction of such nitrogenous matters. At first the starch remains unaffected, but as the disease progresses, it also yields to the destructive action, and is changed into a soluble gummy mass. The small amount of sugar was, doubtless, the first to disappear. In one word, the chemical changes are those which invariably ensue when a vegetable body passes into a state of putrescence.

This being a general statement of the condition of the diseased tuber, the important questions now arise—What is the disease? and what is its cause?

Probably no subject ever enlisted in its consideration such a host of inquirers, many of them being men of talent or good practical observers, and accustomed to methodical habits of inquiry; others, well-meaning writers who served to complicate the subject by speculations thrown out at hazard from evidence contradictory and insufficient. Still, notwithstanding all these efforts of mind to grasp a hidden evil, the very simplicity of its nature becomes manifest from the circumstance that only two theories have been propounded. One of these theories avers that the source of the evil lies in a fungus. The sporules, or seeds of this fungus, have been carried by the wind over all the world; they have entered the plants by the breathing pores of the leaves, first causing the stem to wither and decay, and so vitiating the juices in the under-ground stem, that the tubers receive this unhealthy growth, and become unfit for

food. The mode of growth of fungi favours this opinion, for they throw out abundance of small filaments which might be called their spawn, and these insinuate themselves everywhere through the cellular tissue, destroying its contiguity, and allowing the various constituents of the tuber to mix together and enter into decay. It was argued that analogy confirmed this opinion, for there were many points of similarity in the disease to the decay of apples, which, it was contended, Hassal and others had proved to be due to fungi. It was undoubted that both the spawn, the fungi themselves, and their germs, could be detected in abundance in the diseased potato, just as they can be in a rotten apple; and, therefore, supposing them to be the true cause of rot in the apple, it was fair to accept this as the explanation in the case of the potato. But then chemists had always contended that rot or decay was a true chemical phenomenon, quite independent of fungi, which came there because in the rotten matter they found a soil suited to their growth. Decay, said the chemist, is merely a kind of slow burning of the tissue of the organic substance—a union of it with the oxygen of the air, while putrefaction is a rapid change produced by the progress of the decay when the supply of air is insufficient. It was of the utmost importance to determine which theory is correct, for upon this must be founded our plans for treatment.

Those who insisted upon the fungous origin of the disease had good grounds to fight upon; and, headed by Morren, have drawn up in very imposing battle array. Their arguments are very ingenious, and deserve the most careful attention.

Reasoning upon our assertion that decay is a union of oxygen with the organic matter of the tissue, they take an apple or a potato and cut a slice from it, so as to expose a large surface to oxygen; but the potato does not decay, and they employ this experiment as an argument for their view. They then bruise the surface of an apple, making only a very small puncture to admit the germs of the fungi, and this apple, although not nearly so freely exposed to the air as in the other case, rapidly becomes rotten and covered with fungi. But these experiments are by no means conclusive. Thus when the apple or potato was cut, the clean incision had indeed cut up some of the cells and mixed a little of the juices upon the surface, but these soon dried, and were put beyond the attack of decay, which requires the presence of moisture. In the other case, where the apple had been bruised and the skin slightly perforated, the cells had become ruptured, the gluten and albumen, which are the first to decay, became freed from the control of vitality, and mixed with the sugar and other matters, moisture remained, and air was admitted under all the circumstances most favourable to the rapid progress of decay.

When wine is to be made the grape is crushed; and by this means the easily decaying gluten is mixed with the sugar which had in the fruit been kept in distinct cells. Now decay goes on, known as fermentation, until at last it results in putrefaction. In bruising the potato or the apple a similar mixture of ingredients kept separate in the whole potato had been effected, and therefore the decay went on.

The advocates of the fungous origin of decay then brought forward a new class of arguments in support of this view. They took a sound potato and inoculated it with a diseased one; and that which was sound became also diseased. We have planted the fungi, said they, in the sound potato, and lo! the disease has come. The demonstration was ingenious, so we made another. Sour milk is merely milk which is partially decayed, and surely no one will aver the decay in this case to be due to fungi. Well, on putting an ounce of sour milk in pounds of fresh milk, the latter soon becomes sour. Here is an inoculation of decay where fungi are out of the question. Putrid meat decays fresh meat, because the burning or decay is communicated, just as the flame of one candle will communicate the flame to another, without the future combustion being in any way diminished by doing so. So also a rotten potato may infect a diseased one, just as sour milk will infect fresh milk, and the disease may be unconnected with fungi nevertheless.

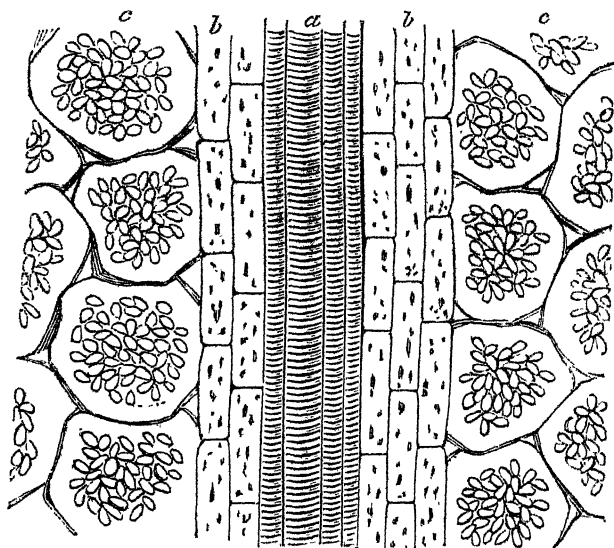
The experiments brought forward by the fungus theorists are not proofs; and therefore let us consider the arguments which, to my mind at least, have brought conviction that the disease is a simple decay of the tuber. In the first place, if the disease were a fungous growth, from its commencement we ought to have evidence of the presence of fungi. Now not the slightest trace of their existence can be detected in the first stages of the disease, even when that is very decided. It is not until the potato is in a very advanced stage of decomposition that either the mycelium, sporules, or the fungi themselves are to be detected. If then no proof of their presence can be given, when there is abundant proof of the presence of the disease, is this not an *a priori* argument for considering them its consequence, and not its cause? Besides, if they were the cause, when we remember what myriads of germs must be floating in the air ready to be taken in by the breathing pores of the leaves of every plant in the field, how comes it that while frequently the half of one field is quite tainted, the other half may be unaffected? The fungi in their creation must be coeval with that of the potato, and yet they never exerted such a virulent action upon them in any former period of their history. Something there must have been in the present year to favour their rapid growth, and if such be the case, that something

must be looked upon as the *cause*, and the fungi as the *effect* of that cause.

Contending then that there is no *à priori* ground for rejecting the idea that the nature of the disease is simply a chemical one, let us see how the phenomena of the disease can be explained on this supposition. I told you that all the products capable of being abstracted from the diseased potato, show that it is in a state of decay. I must again remind you that decay is really a slow union of organic matter with the oxygen of the air—a very gradual burning of the body without flame. If the disease be really a decay, it should therefore commence and extend where air or oxygen is most freely presented to it.

In considering the general anatomy of the potato, you saw that the vascular tissue of the stem did not increase in the tuber. The enlargement of the stem so as to produce the tuber was owing to the great development of the cellular tissue, while the vascular bundles of the stems did not increase in number, but merely elongated themselves and diverged throughout the tuber. Now what is the use of these vessels? There is now scarcely any doubt that the spiral vessels of plants are destined to convey air to the different parts of its tissue. The point at which the disease commences is just at the junction of the tuber with the stem, or exactly at that point where the air-containing vessels are

Fig. III. Diagram representing a portion of a vascular bundle of Potato.



a Spiral vessels. *b b* Cells of the bundles. *c c* Starch cells.

most numerous, and the progress of the disease in the tuber is along these vascular bundles, or along the course taken by the air. This is the very course which theory would indicate as that in which decay should progress, and I advance this as a powerful argument for the chemical nature of the disease.

In Fig. III. a rough representation is made of a portion of a vascular bundle. This is surrounded by empty cells (*bb*), like the vessels themselves, filled with air. Hence the very structure of the vascular tissue of a potato is that which would most facilitate decay if the surrounding tissue were not powerful enough to resist these external influences. In the potato which has become diseased under ground, the disease, commencing at the junction of the underground stem, usually travels along the vascular tissue from one eye to the other, as shown in the diagram (Fig. IV.). Occasionally the disease commences by the vessels in the centre.

Fig. IV. Diagram representing the section of a potato diseased.



a, b, c. Eyes or buds. *d.* Diseased part. *e.* Vascular bundles.

After the potato has been removed from the ground the disease will commence at any bruised part where the putrefactive

juices have become mixed and exposed to the action of the air. The disease then, according to this view, is some constitutional weakness in the walls of the cells, which are unable to resist the action of the air. The cells being destroyed, the albumen and gluten become mixed with the sugar and gum, and putrefaction ensues.

I have already alluded to the decay which immediately proceeds in the grape when its cells are ruptured and its various constituents mixed together. Mr. W. Crum of Glasgow, reflecting on this circumstance, grated down a potato and observed the progress of the pulpy mass in its decay. By thus grating it the cells were torn and all the ingredients mixed together, and exposed to the air. It was only doing quickly, what the disease does slowly. If a potato be thus grated, in a few minutes the pulp begins to acquire a reddish colour; in an hour it is very red, then it becomes brown, and finally black. In two or three days several varieties of fungi begin to appear, in about eight days it is covered with a white mould, and finally acquires a most offensive smell. This experiment of Mr. Crum is a most admirable one, and illustrates the progress of the disease even in the various shades of colour which the diseased potato assumes. Is not this a completely satisfactory solution of the nature of the disease? A perfectly healthy potato, in which sporules of fungi cannot in the least be detected, becomes in a few minutes tainted with the characteristic colour of the disease; the colour changes just as it does in the diseased potato itself; and a soil for the fungi being established, the sporules floating in the air descend upon the mass and grow there. The disease then is simply a decay of organic matter, not peculiar to the potato, for I have been able to produce it in turnips and apples quite as well as in the potato.

By these experiments, then, you must be convinced that the disease is a simple decay of the cells of the potato, which by some constitutional weakness yield to the action of the air, and allow the putrefactive juices to mix together.

This is a great point to have attained, and the next point is—what has produced this constitutional weakness in the cells of this hardy tuber? It is quite decided that the potatoes nearest the surface of the ground, which by exposure to the heat of the sun have become thoroughly matured and even completely greened, have, in almost every instance, escaped the attacks of the disease. On the contrary, it is found that the lowest tuber, that furthest away from the overground stem, and therefore most removed from the action of the light and heat of the sun, becomes soonest diseased. Here then we have decisive proofs that the disease is in some way connected with an imperfect maturity.

The evidence is also completely satisfactory, that the early planted potatoes and those which come to an early maturity have suffered least from the disease. All these circumstances point out clearly that the disease is connected with the state of season. Recollect what has been the kind of weather not only in this country, but all over Europe.

In the early part of the year, when the plants were starting into existence, we had a few days of unusually warm weather, which gave a great impulse to vegetation. You need not be reminded that the products formed in plants are suited to the gradual progress of the seasons, and that, as they advance towards maturity, they require much warmer weather and more direct solar action than in the early stages of their growth. But our last summer has been the reverse of this. Its earlier part was characterized by an unusually forward season, which gave a rapid impulse to vegetation; and when this forward vegetation ought to have been supported by an increasing action of the sun, we had cold, cloudy, and ungenial weather, and few there can be who did not remark our sunless season. The herb of the potato in most cases became strong and luxuriant by the warm weather of the latter end of June and beginning of July, which, finding the soil moist, gave a sharp spur to vegetation. Towards the end of July and beginning of August a complete change came over the weather, which now became cold, cloudy, and although sometimes we had a sudden outburst of the sun, the season altogether was pre-eminently sunless—and recollect that this was just the time when not only the herb but the tuber required the greatest amount of warmth and direct solar action. This was exactly the same kind of weather which produced the disease in America in 1843; and it is precisely similar to that which has been experienced all over Europe in the present year.

Now in the too rapid growth of the tuber in the alternate sunny and rainy days which we had during the early and middle growth, an abundance of water entered the plants, and the evaporation from the leaves being retarded, it was quite impossible for the cellular tissue to become firm and durable. In proof of this I refer to the various analyses which I have made of the healthy and diseased specimens of the same variety of potato—in which it will be seen that the diseased potato uniformly contains more water, must therefore have its cellular tissue less imperfectly formed, and hence is more subject to the disease. These analyses have been made upon stored potatoes, and yet the proportion of water is generally greater than in former years. I have frequently had occasion to examine potatoes in other seasons, and I found them on the average to contain 72 per cent. of water—a result confirmed by Boussingault in France and Boeckman in

Germany. This year potatoes, not stored, contain at least 75 per cent. of water, often much more.

*Proportion of Water in Healthy and Diseased Specimens of
Stored Varieties of Potatoes.*

	Healthy.	Diseased.
Keswicks	75.3	80.7
"	75.5	81.3
York Reds	72.8	79.0
"	67.3	74.7
Kidneys	71.4	75.7
Shaw's	72.1	83.0

Every well-observed fact may be made to coincide with this explanation of the cause. It was a matter of surprise that ill-drained lands often had their potatoes less diseased than those which were drained, and this arose simply from the same fact which rendered the sandy soils on mountainous districts so free from it, viz., that the potatoes did not take such a start on these in the early sunny months, and that they came to maturity more slowly, but more in the order of natural growth.

Recollect that the potato is not the only plant which has suffered from this irregular weather; turnips also have been partially affected, and apples refuse to keep as usual. As the disease consists in a feeble formation of the cellular tissue, the potato was perfectly certain to be the plant most likely to suffer, because its tuber being a mere enlargement of the cellular tissue, and its sap containing a large proportion of soluble albumen, instead of insoluble gluten, as in the turnip, was more prone to decomposition.

If I have made myself intelligible, and have carried you along with me in conviction, you will understand that I conceive the disease to be a chemical decay, passing, if allowed, into putrefaction, and that the cause of this decay is an imperfect formation of the walls of the cells in the potato, produced by the rapid growth at first, the imbibition of much water, and the absence of sun at the time when the plant most required it. The disease, in fact, is a consumption in the potato, just as the same disease attacks a youth who has grown too fast and has his organs not durably developed.

This being the case, it is, of course, no new disease—it must have existed ever since the potato itself; and M. Boussingault informs us that at Bogota, in America, where the plant is indigenous, the disease has been known long—so long that the Indians do not know of its having been introduced.

It has certainly been known in the United States and in Canada for several years, and in Ireland isolated instances have been

known for 20 years. The great prevalence of it is due to the singular sunless nature of the latter part of the season all over the north of Europe.

The frosting of potatoes I look upon as producing the same disease—only it appears in a different form—just as in grated sound potatoes. The frost causes a rupture of the cellular tissue, the juices become mixed, and if left to itself the potato goes into the same state of decay and putridity, accompanied with the heightening of colour under the skin, as in the present instance. The only difference, in my opinion, is that in the diseased potato the decay is first effected by the air in the vascular tissue.

Of course, with these views, believing them as I firmly do, and having arrived at them after careful consideration of all the evidence adduced and opinions given, I entirely reject the idea of a degeneracy in the potato, and of the prospect of its becoming extinct. Such a view has a foundation in mere idle fears, is unsupported by the history of the past or the experience of the present, and has arisen from that very common feeling of ascribing to some mystical and hidden cause that which is either beyond our ken, or which we have not yet had the sagacity to discover the reason.

If the views which I have adopted be admitted by you, it becomes a simple matter to explain the principles upon which we should proceed in storing and in preserving the potato. The disease is a decay of the cellular tissue; but this, like all other kinds of decay, is apt to run into putrefaction. A decaying substance passes into the putrefactive state when moisture and an elevated temperature aid in accelerating the decay. A perfectly dry substance cannot putrefy, although it might undergo a slow decay; and, therefore, dryness is, of all means, the most essential to prevent the disease assuming the malignant form. This is the more essential as all the potatoes have this year an unusual quantity of water. It was to remove this injurious excess of water that the Irish Commissioners recommended so strongly exposure of the potatoes to the action of the sun and air. By this action the potatoes were rendered drier and more able to resist the attacks of decay. At the same time the light exercised a special action on the tuber by calling its dormant into a partially active vitality, and thus enabling it more effectually to resist external influences. Unfortunately this cannot always be carried to the desired extent, because in a few days the starch in the cells begins to be changed into a green waxy substance, and acrid matters are formed in the potato which render it unfit for food. In this country there is scarcely a necessity for referring to this first operation after digging, but unfortunately in Ireland even yet potatoes remain in the ground in many cases of small holdings. In one word, the whole

principle of storing potatoes may be described—and that word is DRYNESS. Some may prefer one way to attain this object, some another: for my own part, I attach little importance to the method pursued, provided the access of moisture is prevented. Innumerable recipes have been given: some have proposed ventilating pits, others ventilating sheds; the Commissioners have proposed dry packing-materials of a specific kind, and a very learned professor has been surprised that farmers have not strung their potatoes on packing-threads as they do their onions. After all, you will follow your own way, and there are innumerable ways in which you may attain the same object—only let these methods be founded on the following principles, which every one will admit to be correct by his own experience.

Strict attention to cleanliness is the first rule in a dairy, and the careful dairywoman knows well that if she has spilt milk upon the table she must not only wipe it up, but she must wash the place on which it has fallen. The reason is, that when the milk is allowed to remain, it passes into a state of putrescence, putrid gases are generated, and these acting on the fresh milk cause it also to turn sour. If a piece of flesh be placed in a perfectly new vessel, it remains a long time without becoming bad; but if put in the vessel which has contained flesh before, it will speedily become tainted. The reason of these facts is simply this, that decaying emanations or contact with decaying substances have the power of communicating the same state of decay to a fresh substance. Pitting potatoes, as in former years, is most certain destruction to the tubers of the present season. Pits are so constructed that the moisture is retained, the potatoes are in contact one with another, the heat generated by decay is allowed to remain, and the most favourable circumstances are united for producing speedy destruction. I myself have seen instances in which potatoes pitted perfectly sound on the Saturday were one mass of black slime on the Monday. Recollect that almost every potato in the country is diseased, properly so to speak—that is, that its cellular tissue has not been durably formed, and that its preservation wholly depends upon your putting it beyond the possibility of decay.

As an abstract statement, without referring to its practicability, the best mode of treating the potatoes of the present year is just to look upon them and try to preserve them as gardeners do their apples. The best mode certainly is, when practicable, to spread them upon a dry floor, each potato slightly separated from the other, and to allow a current of air freely to pass through the room. The gardener does this in the case of apples because the plan combines dryness, coldness, and removal of putrid emanations. But this plan is impracticable when we have to deal with the en-

ture produce of a country. In all our methods, however, we must keep these three conditions in mind—**DRYNESS, COLDNESS, and ABSENCE OF CONTACT.** If you could quite secure the two first conditions, dryness and coldness, the latter, to a certain extent, might be dispensed with. In such cases small heaps of potatoes so disposed as to allow a current of air to pass through them would amply suffice. But in this varying climate, especially on the approach of warmer weather, or when the occurrence of continued wet weather obliges us to close the ventilating shafts, the conditions for putrefaction are again resumed; and, therefore, I do not consider such a mode of procedure a sufficient guarantee against failure. Where, therefore, potatoes have to be preserved out of doors, I would strongly recommend separation of the potatoes, the one from the other, by some porous material. It matters little what that dry porous material is, but it is much to be preferred if it is a disinfecter of putrid matter. In the metropolis there is a manufactory for the preparation of night-soil as a manure, in which a mixture of burnt clay and charcoal is mixed with the putrid soil. The effect is quite surprising, for the soil which possessed an insufferable odour previous to the mixture, is instantly deprived of smell. Burnt clay and charcoal have a remarkable disposition to absorb putrid emanations, and, therefore, to prevent them communicating their state of decay to organic matter susceptible of their influence. Certainly, where burnt clay could be procured, it, of all other things, would be advisable for storing potatoes. But any dry matter will do, such as dry sand or ashes, and if it be porous an advantage will certainly be gained by constructing your heaps so as to admit of ventilation—that is, lay a dry foundation of stones, fagots, or any other thing that will admit the air, with an air-course in the middle. On this foundation put your layer of porous materials, then a layer of potatoes with a little of your porous materials shaken between them, and so continue your overground heap, leaving two or three air or vent holes. Of course, you will thatch this, and take the usual means of preventing frost. The practical details you should lecture to me about: it would be as useless as forward if I offered to you more than the principles upon which you should proceed. The Irish Commissioners proposed a packing stuff for the potatoes, which has been found to succeed admirably, especially when the porous absorptive materials cannot be obtained. It consists in taking two or three parts of earth or clay as dry as can be obtained, and mixing them with one part of freshly burned lime. The lime takes the water from the clay, and, slaking itself at its expense, leaves the mixture thoroughly dry. This dry mixture is useful not only as a dry means of separating the potatoes, but also by destroying the vegetative powers of the sporules of the fungi.

Although I have told you that fungi are not the cause of the disease, still their presence aids very materially in accelerating its ravages by their filaments or spawn insinuating themselves between the cells and facilitating their decay. Lime is fatal to the growth of these fungi, and therefore aids in retarding the progress of the disease. I attach little importance to the mode in which you procure these three requisites for the preservation of the potato—dryness, coolness, and removal of contact and decaying emanations. Do but ensure these three essential points, and any plan will succeed. Only I prefer recommending the use of dry mineral materials to organic matters, such as sawdust and straw, because these might possibly also enter into decay and increase the evil.

These recommendations as to storing potatoes refer to those in which decay has not manifested itself, for it would be madness to mix rotten with sound potatoes.

But why do I not speak of those popular panaceas which have been put forth as checkers or curers of the disease? Do I not know that Morren has recommended chloride of lime? Am I ignorant that many chemists have pointed to chlorine and sulphurous acid? Is it possible that I have forgotten how to dip potatoes in nitric acid, how to acidify them with muriatic acid, how to dissolve the disease by aqua regia or oil of vitriol, or how to puzzle the brains of the peasant with innumerable nostrums and impracticable schemes?

No, I have not forgotten these; but I have recollected that I am treating of a national calamity, and am not treading the boards of my laboratory. I have recollected also that gases and acids will not build up an imperfectly formed cellular tissue, which is the true nature of the disease; and that although they may arrest for a time the progress of decay, they do not do it more effectually than dryness and exposure to air, and would require a nation to become chemists before they produced an extended or effectual result. If potatoes are so far gone that they will not keep by the means proposed, then ought they to be treated as those unfit for human food, which is the subject of my next lecture.

LECTURE II.

On the Treatment of Decayed Potatoes, and on Seed for a future Year. By Dr. LYON PLAYFAIR, Consulting Chemist to the Royal Agricultural Society.

IN the last Lecture the nature of the so-called disease in the potato was considered, and shown to be a decay of the cellular tissue, which was unable to resist the action of external influences. The probable cause was considered to be the unusual sunless nature of

the season at that period of the year when both the plant and the tuber required most direct solar action.

If the nature of the disease be admitted, then a most important practical consideration arises. The constitutional weakness in the cell walls must exist in all those potatoes which, as yet, have shown no symptom of decay. This being the case, every potato is liable to yield to external influences, and will certainly decay unless it be placed under such conditions as to render the progress of decay impossible. We know what these conditions are, and therefore the further progress of the malady must be entirely the result of negligence and ignorance.

With the complete conviction that potatoes will still progress in decay unless cared for and properly treated—with a full knowledge that even the extent of the calamity will not induce the peasant at once to depart from his former coarse mode of treating the tubers, it becomes a most important question for intelligent farmers, where they are to look for seed for a future year. Under ordinary circumstances I would have refrained from lecturing on this practical point, but the conditions are peculiar, and Science can be our only guide; for experience does not exist to point out a well-trodden path upon which Practice herself may walk without scientific aid. The question becomes of great importance when we consider the state of the crop. Whatever may have been the case in favoured localities, all those who have had access to the most extensive information agree that the potato crop this year was not much, if at all, above the average. This being the case, we must have had in this country only a sufficient supply for seed and for domestic consumption. A considerable part, no matter what proportion, of the crop is destroyed; and, therefore, supposing the home consumption to be as great as formerly, there must be a deficiency of seed for spring planting, if we continue to follow the old methods. But these methods are not indispensable; and, therefore, it is of importance to know how far we may relax them, so as to suit the exigencies of the present case.

The anatomical structure of a plant is very complex, but its organization, so far as it is necessary to view it with relation to agriculture, is remarkably simple. It is well known that one part of a plant may be transformed into or be made to produce another. The leaf of an orange or fig-tree, when planted, produces a new orange or new fig-tree; the branch of a tree stuck in the ground is changed into a tree similar to that which produced it; the tuber, or fleshy enlargement of the stem of the potato plant, occasions a new plant to arise: and the transformation or production has been so far carried on, that Woodward turned a willow tree upside down, and the branches put in the earth acquired a fibrous struc-

ture like roots, and the roots themselves soon became covered with leaves like branches. It is not necessary for the production of a plant to use the seed itself; and on this account we may grow the potato in several different ways. We may produce it from the seed, which contains the true embryo; we may raise it from the tuber, or whole potato; or we may grow it by planting only part of the tuber. Let us consider the mode of growth in each of these three cases, in order that we may be satisfied as to the course which should be adopted in the present exigency.

The seed of the potato is contained in the green *apple* or capsule, which becomes black when ripe. The seed is removed from this capsule and spread out in the sun to dry. As an agricultural operation, the seed is occasionally planted in spring by sowing it broadcast, and the tubers taken up in October. By that time they have acquired the size of small plums, and are preserved and sown again next April.

Before gathering this second year's crop it is necessary to bear in mind a peculiar circumstance connected with the produce of the seed. When potatoes are grown from the tuber, any peculiarity which this may have exhibited, such as early growth, colour, or tenderness, is exhibited and perpetuated in its descent. Thus, a York red produces invariably a York red, and not a kidney: but this is not the case with the produce of the seed. In the crop grown from seed, we do not find the peculiarities of the plant on which it grew, but find mixed together, white, red, and dark coloured potatoes, some being round, some oval, some kidney-shaped. Their habits also are very different: thus we have some coming to an early, others to a late maturity; some are coarse, others tender, in their growth. In reaping, therefore, the second year's crop we must recollect to watch the plants, and separate them according to their peculiarities. Those which ripen early, as shown by the dying away of the stem, must be first gathered, in order to perpetuate this peculiarity in their descendants. The kidney-shaped tubers are to be separated from the others, and like attention must be paid to select and keep those varieties which show any peculiar merits. As a horticultural operation, the return from the seed can be accelerated. They may be grown in hot-beds, and by transplanting into other pots the plants may be ready for border or field culture in the spring, and thus produce tubers of a larger size than those obtained by sowing the seed broadcast. But all this must suffice to show you that the growth from seed is not that to which we must look as calculated to relieve the scarcity of seed potatoes for the year now approaching.

The second plan of growing potatoes is from the whole tuber. The tuber being merely a continuation of the stem, is furnished

like it with buds, or eyes, symmetrically arranged on each side. These buds are capable of growing plants, but when the whole tuber is planted it is usual for them to yield to the upper buds or crown, either by not putting forth shoots at all, or by giving very feeble ones. There are two periods at which the tubers are planted: usually the spring is selected, but autumn or winter has been found to answer equally well, if they are planted deep enough to prevent the attacks of frost. The advantage of planting them now consists in the earlier return which is obtained, the increased chance of safety which it gives to the tender tubers to survive the season, and to yield a produce which may escape the scourge next year. In planting potatoes now, it is indispensable to dry them in the sun, and even to green them so as to enable the tubers to resist decay. The practice is not a new one, having been followed for many years in the district of Fingal for the purpose of supplying the Dublin market at an early season. It has received the sanction of Professor Lindley, whose authority in such matters is very great; and it has been practically tested and approved of by eminent agriculturists, among whom it may be sufficient to mention Mr. Grey, of Dilston, who has found that there is an actual increase of one-third in the produce of autumn-planted potatoes over those which are planted in spring. It is a matter of common observation, that potatoes which have remained in the earth during the winter, are found to be in a sound state when the land is ploughed up for other crops in the spring. The advantages of early planting are certainly due to a considerable extent to the careless mode of preserving our stored-up tubers till spring. We have been accustomed to view the potato as a plant which will grow anywhere, and keep under any circumstances. We have treated it in the most rude way, both in its cultivation and preservation—in a manner much more rude than we have dared to employ towards any other field crops. During the last few years the potato has begun to rebel against this cruel treatment; its sets have rotted in the ground and refused to grow as usual, and it has alarmed growers with the apprehension that it is about to forsake them altogether. Undoubtedly it will do so in course of time, unless it receives more tender treatment at their hands, unless it is stored with the same care as to ventilation and dryness which we give to our other crops, and receive somewhat more of attention in its cultivation. Our old mode of pitting potatoes is in every way reprehensible; and it is only wonderful—shut out as they have been from air, exposed to moisture and decaying emanations, covered over with damp coverings of clay, through which no air could penetrate—that their vital vigour has lasted so long as, year after year, still to supply us with food. It is because the conditions in which they are placed under ground

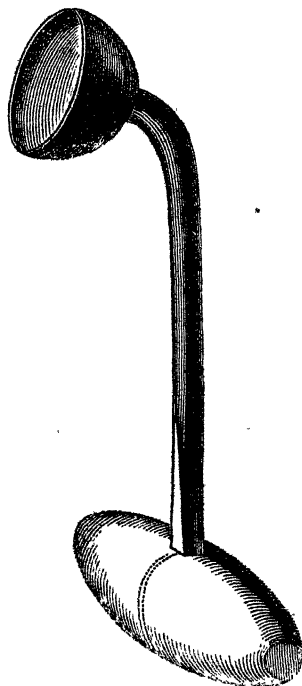
are more favourable to their after-development than that to which they have been exposed in pits, that autumn-planted potatoes have yielded a grateful return for their kinder treatment. Now, when we consider that it is impossible at once to ascertain whether those who have been accustomed to behave to their potatoes thus roughly will at once follow more kindly modes of treatment, it is certainly advisable to encourage the planting of potatoes *now* if the weather prove favourable for doing so, rather than allow the weak tubers of the present year to perish under the rough usage which their hardy ancestors were unable to bear.

Whole tubers planted now will certainly have a better chance than cut sets to struggle against the dangers which still beset them. But, at the same time, it must not be forgotten, that in planting the whole tubers we are sacrificing much which might be useful for seed in a time of scarcity. The buds or *eyes* have each of them the power of producing new plants, some more quickly and vigorous than others. It is an acknowledged fact in practice, that tubers imperfectly matured grow plants more vigorous than those produced from the fully ripe potato. Owing to this circumstance, the upper or youngest eyes of the potato yield a crop nearly a fortnight sooner than that grown from the under eyes. The middle eyes, in the same way, may be made to produce an intermediate crop. The separation of these are niceties not usually introduced into practice, but which may become necessary on occasions like the present. Any scarcity of food may be met to a considerable extent by forwarding the growth of our crops next year. Suppose, then, that we select early varieties for planting, and that we use the top eyes for our earliest crop, or plant the small tubers whole *now* (in which case the crown eyes will grow to the exclusion of the rest), we may obtain early crops to come in aid of any expected scarcity. An opinion some time since prevailed that we were to look to foreign countries for our seed potatoes. But consular returns have shown us, although commercial enterprise may furnish a good supply from Galicia and Bordeaux, still that when we consider the immense amount which would be required for new seed—800,000 tons for Ireland alone—it is obvious that this importation would only very partially relieve our exigencies, and that to a great extent we must depend upon our own resources. Now it very fortunately happens that we may obtain a very large provision of seed from potatoes used for domestic consumption, without to any serious extent diminishing our supply for that purpose. If the eyes be preserved along with a small part of the potato to serve as nutriment for the young plant, they may be planted in spring and will produce plants as well as the tuber. This is no mere theoretical opinion: it is a practice constantly followed out in Canada and Brussels, and has

been experimentally tested by various persons in this country. The mode of extracting the buds is exceedingly simple: the crown may be cut off to the depth of a quarter of an inch; and the single eyes may be removed by a scoop, of which a drawing is presented in Fig. V. A very little practice with the scoop makes the ope-

Fig. V. Representing the scoop for removing the buds or eyes of potatoes.

Actual size.



rator expert: it is first pressed down firmly over the eye, and then gradually turned round so as to scoop out all the ring marked by the pressure. The eyes thus removed should be shaken in a bag with a little lime so as to dust them over with this substance; and, after lying exposed to the air for twelve hours until a skin forms upon them, should be packed up in perfectly dry wood ashes, peat ashes, or other very dry materials; when spring arrives they may be planted. By this simple operation a prodigious quantity of seed may be preserved for next season without diminishing

to any material extent the daily amount of food. Of course it is intended that the operation should be performed just as the potatoes are about to be used for the domestic supply.

It becomes an important question as to how far it would be safe to plant diseased potatoes. In the first place, it is undoubted that they will germinate and produce apparently healthy plants; but it is equally certain that there is a risk of their rotting in the ground before the formation of the young plant. It would be highly imprudent to plant diseased potatoes when sound ones can be procured; but in the absence of these the farmer may be inclined to run the hazard. If the young plants be produced, I have little apprehension for the communication of the disease; for even on the fungous view of the malady, it does not follow because germs of fungi are present that they should be developed. However, it must be recollected that very eminent authorities are of a contrary opinion, and believe the experiment to be in the highest degree dangerous, and therefore the practice must not be rashly entered upon.

Connected with this subject, it is worthy of consideration how far land which has grown potatoes this year is likely to be dangerous for crops in the succeeding seasons. On this point, also, there are various opinions; but, for my own part, believing fungi to be the consequence and not the cause of the decay, I do not apprehend any serious result. It is quite true that seed immediately sown upon land abounding in the decaying matter might become affected, and afford a soil upon which fungi might vegetate; but exposure to the air by ploughing that land would destroy the decaying matter and fit the soil for future crops. Any apprehended danger might also be entirely guarded against by treating the land with lime, which not only would aid in destroying the decaying matter, but also prevent the germs of fungi from vegetating. We must recollect that this scourge has appeared for three successive years in America, and an excess of caution is not reprehensible to prevent a similar calamity to this country.

I trust these considerations will be sufficient to aid you in the treatment of sound tubers both for storing and for seed, and I now proceed to another part of the subject.

The manner of treating diseased potatoes described in the last lecture applied only to those which were still fit for human food. Those which are not fit for domestic use must be treated in a different manner.

Much alarm has been created by persons ignorant of the action of organic poisons as to the injurious effects which may arise from giving diseased potatoes to animals. The disease produces no specific poison, and the only possibility of injurious effects from

their use is that they might act in the same way as other decayed matter. Well attested instances are certainly on record of the communication of loathsome disease to persons who have partaken of decayed sausages or putrid bacon. But in every such instance of disease the decayed aliment has been partaken of in a cold state, and long after the substance had been exposed to the action of heat. As the injurious qualities of such organic substances are not due to any specific compound, but merely to their *state of decay*, we know with certainty that the progress of decay is stopped by exposure to the heat of boiling water. If, therefore, the diseased potatoes be given to an animal shortly after being boiled, there need not be the slightest apprehension of danger. In fact, M. Bonjean of Chambéry has completely set this at rest—had any doubt ever existed. He lived for several days on boiled potatoes, which had been thrown away as refuse, and drunk 8 oz. of the water in which they had been boiled—water sufficiently bad, for he describes it “of a yellowish brown colour, turbid and thick, of a slightly disagreeable smell and nauseous taste, leaving a bitter impression on the palate which lasted for several hours.” With the boiled potatoes, M. Bonjean perceived no unusual effect: the water, however, produced “a disagreeable burning sensation in his chest which lasted for a few hours; but this experiment was altogether unnecessary, and there is no such risk in ordinary cases. Although the Irish Commissioners never doubted the safety of giving diseased potatoes to animals, after the tubers had been boiled, they fed pigs and a cow on tubers in a very advanced stage of decomposition without observing the slightest prejudicial result from doing so. It is quite true that potatoes actually putrid have produced disease in the lower animals; and I have received documents from Dr. Buckland referring to a case in which pigs were thus poisoned, but in all these cases the potatoes were given raw and not boiled. The diseased part of the potato contains an acrid bitter principle, which renders it of a disagreeable taste, and when it is intended for domestic use the affected portions should be excised, and the remainder, after being boiled, is still as good as before the tuber became tainted.

With the cut-out portions of potatoes used for human food, and with those diseased potatoes which are not converted into money by fattening cattle, we are enabled to save a great proportion of the nutritious matter which remains.

Starch is the principal ingredient characteristic of the potato, but the quantity present in the tuber depends upon the variety. Payen has examined this subject, and the following tabular statement of his results shows not only the proportion of starch, but also the produce of varieties grown on the same kind of land:—

Varieties.	1 cwt. Seed produced	One statute Acre produced	100 parts contained		
			Water.	Starch.	Gluten and Fibre.
	Cwt.	Tons.			
Rohan . . .	58	14½	75·2	16·6	8·2
Large Yellow .	37	9½	68·7	23·3	8·0
Scotch . . .	32	8	69·8	22·0	8·2
Slow Island .	56	14	79·4	12·3	8·3
Legonzac . .	32	8	71·2	20·5	8·3
Siberian . . .	40	10	77·8	14·0	8·2
Durillers . .	40	10	78·3	13·6	8·1

All of you are familiar with the process of procuring starch from the potato. It consists simply in grating down the tuber and washing it with water. The starch, as shown in the previous lecture, is imprisoned within cells; and in grating down the potato we tear down the walls of the cells and liberate the little granules of starch. These are insoluble in cold water, and generally are not larger than the $\frac{1}{100}$ th of an inch in diameter; consequently, when we pour upon coarse cloth the grated mass stirred up and suspended in water, these small globules will pass through while the woody fibre and other constituents of the cell walls are retained on the cloth. The starch which has passed through still continues coloured by a little of the diseased matter, but this may be removed by three or four washings and depositions. This starch, after having been dried, may be preserved for any length of time.* The residual pulp remaining on the cloth contains still a large proportion of nutritious matter, which becomes easily putrid and occasions a considerable nuisance in the neighbourhood of large starch manufactories. In Paris the nuisance of this was so great, that endeavours were made to convert it into some practical use, and it was found that in this advanced stage of decomposition, it formed an admirable manure for land, especially when applied in the liquid form by irrigation. More lately it has been used for feeding cattle with good results; nor will this be surprising, when we remember that it contains all the insoluble gluten of the potato. An analysis of the dried pulp thus procured showed that it contains 6 per cent. of gluten, which gives it about half the nutritious value of oats. Of course our great care should be to economise the greatest quantity of the valuable ingredients of the diseased potato. Now if the pulp can

* I have thought it unnecessary to enter into any detailed account of the manufacture of starch, as this is now practically carried into execution in every part of the country.

be freed from the disease in an easy manner, it would be in the highest degree culpable not to preserve it. It happens fortunately that the diseased part of the potato, when the tuber has not become much dried, is almost wholly soluble in water; or at least, which practically amounts to the same thing, that the parts which do not dissolve are so light that they may easily be removed from the sound matter by pouring off the water. This being the case, we can obtain almost all the really valuable portion of a diseased potato by simply grating it down and stirring it up with water. The diseased portions dissolve in the water, and the pulp and starch fall down together. The red-coloured water must now be drawn off, and fresh water again put on; this washing, repeated twice or at most three times, gives a mixture of pulp and starch, which when dried and ground offers a meal similar in colour to oatmeal. Professor Liebig recommends a very good plan when oil of vitriol can easily be obtained: it consists in slicing the potato and immersing the slices in water containing enough sulphuric acid to render it very distinctly sour to the taste. The slices must afterwards be washed with frequent water, as the acid adheres very obstinately. The addition of acid to water is useful, especially when the disease has been much dried in. In most instances, even when water alone is used, it is not necessary to grate down the potato as we do in making starch; it suffices to cut it into pieces, in the same way as we slice turnips or potatoes for giving to cattle. The only evil attending the process now described is the removal of the soluble albumen. As the albumen is carried off in the water employed in washing, one *half* of the really nutritious matter of the potato thus disappears: but when we pursue the common method of making starch and neglecting the pulp, the *whole* of the nutritious matter is removed, and we obtain only starch, which by itself is not fitted to support animal life.

Other processes for converting diseased potatoes into wholesome food have been recommended; and as one of them, viz. steaming, has received the powerful support of Dr. Buckland, I shall allude to it in the first place. It consists in passing steam through a vessel containing potatoes until they are rendered soft, after which the softened mass is to be rammed down into airtight casks, which are to be covered with melted fat. The potatoes must previously be pared, the diseased parts being cut out, and these are to be preserved separately. A plan very similar to this is that proposed originally by Parmentier, of boiling potatoes after being peeled, crushing down the boiled potatoes and drying the mass.

It is quite undoubted that these plans yield a very excellent article of food, and they ought to be followed when circumstances

admit of their being carried into execution: but I apprehend that they are not sufficient to meet the exigencies of the case, as far as regards the peasant. Every person knows how easily a boiled potato becomes bad and suffers decay. The housewife is so sensible of its liability to do so, that she often uses it as a kind of yeast. It is this tendency to decay which renders it necessary to preserve them in air-tight casks, and not only to pour melted fat on the top, but also over all the joints. If we had to deal with bushels of potatoes this might be effected, but when we have to treat a considerable fraction of the produce of a whole country, such processes assume an aspect altogether different. At all events I know that the Irish peasant will not purchase casks and fat even if he had the money to do so. Parmentier's process also requires good casks, and is still more unsuited for the circumstances of the case, because in addition to the extraction of the diseased parts and removing the skin of the potato, additional labour and expense is employed in the two fuels and apparatus necessary for boiling and for drying—the latter of which operations is no easy task, from the glutinous nature of the material.

Another plan, attended with perhaps as little trouble as any, consists in cutting the potato into thin slices and drying them upon corn or malt kilns. In doing this, several precautions must be followed to secure success. The heat must be applied very slowly indeed, and should not be raised much above 100° until the end of the operation, because a hard skin is apt to form on the exposed parts of the slices and prevent the escape of water. It has been proposed, and the proposal seems to me to be a good one, that the slices should be allowed to dry in the air for some time, by being hung up like onions and afterwards kiln-dried. However, the latter must be carried to the point of thorough dryness, for partial dryness only increases the evil, because the heat destroys the vitality of the tuber and renders it more liable to decay. If the whole potatoes be partially dried by artificial heat so as not to raise the temperature sufficiently to injure the vitality of the tuber, I am assured by Mr. Warrington that they are capable of preservation. His experiments, however, have not been made on a large scale. Of course in all operations for economising decayed potatoes, that method is to be preferred which yields the greatest return with the least labour and expense. It is for this reason that I have coincided in the recommendation of the Irish Commissioners, that simple washing of the grated mass is the process best adapted for the cottage. After the three washings described, the water may be poured off, and the mass collected in a coarse canvass cloth or towel, which is then put on a box or stool and the water removed by pressure. Very considerable pressure may be given by placing the end of a spade in

the bar of a grate or in a nick of a tree, and the stool, upon which the towel containing the pulp is placed, below the broad part of the spade: the handle of the spade is then pressed downwards, and by this means a powerful lever is obtained, and the water flows out freely from the pulpy mass. It may then be mixed with half its weight of oatmeal and a little salt, and be at once converted into good palatable cakes on the griddle. The moist mass may also be dried and ground into meal. This substance, which may be called potato whole meal, can be used in making bread, soup, or pottage. It must be borne in mind that cold cakes or bread would be a miserable substitute to the peasant for hot potatoes: on this account soup or pottage ought to be given along with the bread, and this whole meal makes a very agreeable and economical soup, when mixed with some bacon or herring. At all events I can testify that I partook of an agreeable soup without knowing from what it had been made, and found on inquiry that it was made of this potato whole meal, a little bacon, salt, and pepper, and that the total cost of its production was $1\frac{1}{4}d.$ for 5 pints.

This leads me to the consideration of an important point connected with any expected scarcity. Should any such misfortune assail us, it is of the first importance that we should act advisedly and not ignorantly in our endeavours to alleviate it; and we can only do so by a thorough knowledge of the nature of different aliments.

In setting a steam-engine to perform daily work, we are well aware that there are two conditions to enable it to perform its duties. In the first place, we must supply fuel to convert water into steam, and we must keep the engine itself in thorough repair, immediately repairing any failures in its piston, its cranks, or wheels, and seeing that all the parts are kept proportionally strong for the work to be performed. We know that the coal, which answers admirably for fuel, would be most inappropriate for the repairs of any damaged part of the engine itself. Just so is it with the machinery of the animal frame. It requires fuel to keep it in action, and it requires materials of a different kind to repair the damaged parts of its frame. The conditions of sustenance are therefore very different, and the kind of aliment depends upon the want to be supplied. For example, the hard-working man requires to be supplied freely with those materials necessary to build up his muscles, for these are partially destroyed with each exertion. The labourer, who has much hard work to perform, must eat a very large quantity* of potatoes to get through that work, while a much smaller quantity by weight of oatmeal

* An adult labourer must eat 14 lbs. of potatoes per day to get through a good day's work.

would suffice—the amount of true nutriment in each being in the proportion of 1:6. All food then has two distinct purposes—the formation of flesh, and the sustenance of animal heat. The substances in vegetables destined for the formation of flesh are perfectly identical with it in composition, and are known by the names of gluten, albumen, fibrin or casein; those which are suited for the support of animal heat are not at all similarly composed to flesh, and consist of starch,* gum, sugar, &c. Knowing these facts, it becomes a money question as to the value of particular kinds of food for the support of the frame. We know how much of flesh-giving principle each variety of food contains, and therefore we can at once estimate how much of each it will be necessary to consume to obtain 1 pound of real nutriment, and what the cost of that pound will be to the consumer. The following table is constructed on this principle, but as prices vary in different localities, these may be altered to suit the peculiar case: in the table, they are given at the rate at which the respective substances might be purchased in London under favourable circumstances.†

Quantity of Food necessary to produce 1 lb. of Flesh, and the Money-

Cost of its production.		£.	s.	d.
25 lbs. of milk furnish 1 lb. flesh, and cost .		. 0	3	1
100 „ turnips „ .		. 0	2	9
50 „ potatoes „ .		. 0	2	1
50 „ carrots „ .		. 0	2	1
4 „ butcher's meat, free from fat and bone, furnish 1 lb. of flesh, and cost .		. 0	2	0
9 „ oatmeal „ .		. 0	1	10
7 $\frac{1}{8}$ „ barleymeal „ .		. 0	1	2
7 $\frac{1}{8}$ „ bread „ .		. 0	1	2
7 $\frac{1}{8}$ „ flour „ .		. 0	1	2
3 $\frac{1}{2}$ „ peas „ .		. 0	0	7
3 $\frac{1}{8}$ „ beans „ .		. 0	0	6 $\frac{1}{2}$

The extremes shown by this Table are very remarkable: for while it would require only 3 lbs. of beans to furnish 1 lb. of flesh-giving principle, it would require 50 lbs. of potatoes, or 100 lbs. of turnips to yield the same amount, at a cost four times

* When so much starch is being made from diseased potatoes, it must always be borne in mind that it is not *nutritious*, properly so to speak; that an animal fed upon it alone would die nearly as soon as if deprived of food altogether. It is fuel for supporting animal heat, and therefore forms an excellent addition to meal, flour, or peas.

† Of course each person will find some errors in the prices attached to the articles as shown by his own experience, and he may correct them by the data given in the first column; the difference will, however, be merely relative, and not affect the general result. A very useful lecture on the money-cost of food has been given by Mr. Ransome at Manchester.

as great. For supporting the animal frame, POTATOES CANNOT BE A CHEAP FOOD. In order to obtain from them the requisite quantity of nutritious principle, an enormous quantity must be consumed, and this to the loss of a considerable quantity of the other useful ingredients of the food. The excrements of Irish peasants contain an abundance of unaltered starch granules, which have passed through the body unchanged, without exercising their peculiar function in the support of animal heat.

The potato is a food well destined to support the heat of the frame, and admirably fitted as an *associate* of other aliments. It is with this view that the rich use it with meat, trusting to the latter for the formation of muscular tissue, and to the potato for fuel to keep up the heat of the body; and in such a mixture there is absolute economy. Let us look at the various kinds of food with reference to their value as fuel, and we shall perceive that the potato takes its proper rank. Such a table as the following is, however, a mere rough approximation, for the carbonaceous matter or fuel is of very various kinds, and some of them give more heat than others by their combustion. The Table, therefore, must only be taken for as much as it is worth—a rough approximation to truth.

Table showing the Approximative Value of various kinds of Food as Fuel to sustain Animal Heat.

4	lbs. of potatoes contain 1 lb. of carbonaceous fuel, and cost	£.	s.	d.
		0	0	2
10	„ carrots „ „	0	0	2
1½	„ flour „ „	0	0	2½
1½	„ barley meal „ „	0	0	3
1½	„ turnips „ „	0	0	3½
1½	„ oatmeal „ „	0	0	3¾
1½	„ beans „ „	0	0	3¾
1½	„ peas „ „	0	0	3¾
2	„ bread „ „	0	0	4
1½	„ milk „ „	0	1	5

It will be seen by this Table that potatoes have now mounted to the head of the Table as the least expensive material for furnishing fuel to keep up the heat of the body; although it was about the most costly for building up the frame, or supporting strength. Surely no further arguments are necessary to condemn the use of the potato as the sole food of a people, when it was obviously destined as an accessory to other food. We must then admit the following conclusion:

THE POTATO USED BY ITSELF IS ONE OF THE MOST EXPENSIVE MEANS OF SUPPORTING THE ANIMAL FRAME; BUT IT FORMS A CHEAP ADDITION TO OTHER NUTRITIOUS ALIMENTS IN SUSTAINING ANIMAL HEAT.

This is a conclusion that cannot be controverted ; and therefore we must consider—What is the cheapest mode of furnishing the greatest amount of sustenance in a time of scarcity. Let us look to the leguminous plants, peas and beans. Dr. Buckland has shown that peas formerly constituted an important part of the diet of the people of this country—at a time, too, when our forefathers were more hardy than ourselves—and he has written strongly urging their more general cultivation for the sustenance of the poorer classes. He has been attacked by a portion of the press for this opinion—who have acted in this matter not less ignorantly or unjustly than the peasants in France, who pelted with potatoes the first man who endeavoured to bring them into cultivation in that country. Peas, beans, or lentils, are undoubtedly the cheapest means of supplying nutritious matter, which they furnish at one-fourth the cost of the potato. Their value has been known from the very earliest time ; * and before the introduction of potatoes they formed a staple article of food among our soldiers and labourers, and were not then banished from the tables of the wealthy.† It is true that, when used alone, they are apt to cause flatulence, from the simple reason that they contain a superabundance of flesh-giving principle, which, not being wholly assimilated, enters into putrescence, and gives rise to the gases productive of flatulence ; but I am arguing against the exhibition of any one variety of food. Peas mixed with a proper quantity of potatoes would not produce flatulence, and the mixture would yield about the cheapest possible nutriment. Even the cereal crops—oats, wheat, and barley—offer a nutriment cheaper than potatoes ; and if mixed with the latter in a dietary would afford a cheap means of sustenance.

If these views be just, it becomes a matter for very grave consideration, Whether we should ever again devote so much land to the cultivation of potatoes as we have hitherto done. It has been proved that it is *not* a cheap mode of sustaining a population ; physiology and experience both point to a variety of food as best suited for the maintenance of health and strength ; and the history of the past teaches us that variety of aliment is important in relieving the community from the dependence on two or three sorts of food, and the casualties attending their growth. In this last—the economical point of view—the question is of the highest importance ; for whatever agricultural science may do to mitigate the effects of seasons or casualties on our crops, there are always evils attending the dependence on one or two kinds of food. Thus, it causes an unusual demand for labour at a particular

* The pottage for which Esau sold his birthright was made of lentils.

† In Holinshed's Chronicle is the passage—"A large mouth, in mine opinion, and not to eat peasen with ladies of my time."

period of the year, as in the case of harvesting the cereal crops, and leaves the labourers unemployed in the intervals. This, in the case of the Irish peasants, whose skill and industry is applied to the cultivation of one root, has the effect of reducing the value of both. There is not sufficient use for the intellect in its direction to practical and industrial skill, and there is no motive for acquiring habits of steady labour. The more extensively that we cultivate a variety of vegetables—the more that the various capabilities of our soils are developed in their proper direction—the more will labour be steadied and equalized, our markets be freed from those shocks attending the casualties of a single crop, and our population relieved from the dread consequences of famine. Why is it that in England we do not win those favours from nature in the variety of produce that afford such grateful food to other countries? Lentils contain the greatest amount of nutrition of any of the leguminous plant; they form one of the staple articles of the food of the labouring classes in other lands, and yet they are scarcely known in this. Rye is well suited to poor lands; it forms a nutritious bread, universally used in Germany and Hungary, better far than potatoes; and if it has not met the success in this country which it deserves, depend upon it the miller and baker are more to be blamed for the failure than bountiful nature. If from their bulky nature tubers are preferred by the poor, why is the Jerusalem artichoke forgotten, which of all plants yields the greatest return for the least amount of manure and labour. Frost does not injure the tubers of this plant; they may be left in the ground all winter, and just taken out as they are to be used. If a little piece of ground be devoted to them, they are so grateful for this privilege that year after year they will spring up without planting; because, however diligently we try to remove them, enough remains in the ground for next year's crop. This makes them inconvenient for rotation, but is an advantage in the cottage allotment. In fact the Jerusalem artichoke is a most grateful plant, and will fully recompense us for any habitation, provided we do not give it a wet bed to lie in. We have also the parsnep, which formerly was cultivated to a greater extent in Ireland than it is now. However, all these bulky plants should never supersede the cultivation of the cereals and the leguminous crops.

I am firmly convinced that the intelligent portion of this community have now the opportunity of converting the apparent evil of a failure into a great real and national blessing. They have the power to introduce the cultivation of more economical and useful crops, and, in doing so, to effect the social and moral improvement of the people. Should a scarcity unhappily arise, they have in their power to improve greatly our miserable cottage cookery by introducing a greater *variety* of viands, more palatable,

healthier and cheaper, because more substantial, though seemingly dearer than those now in use. We have thus the power of creating a permanent desire for better food, and this would give the greatest impulse to labour in Ireland. It is the absence of wants which in the first place so depresses a peasantry, and brings with it a train of evils arising from the non-application of skill and industry to gratify them.

Finally, if I have convinced you that it is most desirable, on economical grounds, to introduce a greater variety in the crops cultivated for the support of the labouring classes, and to diminish in extent the cultivation of potatoes, I would still further impress upon you the prudence of doing this in the present year. This is not the first malady to which the potato has been subjected. In Hanover, and in other parts of Germany, a disease broke out in 1770, and remained there till 1779, making its reappearance in 1790. The dry-rot which attacked the potato in this country in 1832 did not disappear till 1840, luckily making but little ravages with us, but acting as a scourge in various German provinces. In America the same disease that now afflicts us has lasted for three years, and this year has again committed most formidable evil. There is nothing at all improbable in the belief that it may remain in this country for several successive years. We know that potatoes grown from the tubers inherit any peculiarities shown by their ancestors. This year circumstances have caused a feeble cellular tissue in all the potatoes throughout the country, similar, in fact, to what always exists in some of the tender early varieties. How do we know that, unless we have an exceedingly favourable season, this weakness of cellular tissue, which renders it unable to resist external influences, may not be imparted to the descendants of the present race, so that several years must elapse before it is again built up in its proper strength? And, in our ignorance of meteorology, who can say that such seasons as the last may not possibly be in store for us? I affirm none of these things, because I am deeply ignorant of any laws of nature which would enable me to read these phenomena aright; but from the very conviction of this ignorance, I feel it would be presumptuous not to admit that such circumstances might possibly happen. I have confidence in the mercy of the Creator, but I know also that such afflictions arise often for our good. With this doubt and ignorance on a subject so hidden, I think it would be highly desirable to devote part of the land which hitherto has been under potato cultivation for the growth of leguminous plants, so that, should we be afflicted with this scourge in another year, we may lessen the force of the blow by a wise provision against its consequences.

I have now completed my task, very imperfectly I admit, but

as far as I think I am warranted by the circumstances in endeavouring to lead you. I might have indulged theories and speculations, but this would have been worse than useless when we have to combat with a great practical evil. I have endeavoured to show you what is best to do at present, and what prudence points out as the proper course for the future; and, above all, I have been anxious to convince you that it now lies in your power to convert this national curse into a national blessing, and to make great good spring out of great evil.

MISCELLANEOUS COMMUNICATIONS AND NOTICES.

VIII.—*Report on the Wheat selected for Trial at Southampton, and on other Wheats.* By W. MILES, M.P.

HAVING been requested to prove by trial the value of the wheat selected by the judges at Southampton, I beg to submit to the Council the following Report.

The different sorts I determined to try against the prize wheat were four—namely, Jonas' prolific seedling, the red-straw white, the Hope-town, and Fenton. The first of these I had grown every year since carrying out the wheat experiment for the Society in 1841, with uniform success, and without going from home for change of seed. The second I procured from Mr. Morton, who has for some time grown it at the Example Farm, and who speaks highly of its character. The third I obtained from Mr. Sheriff, who himself raised it from a seedling; this sort is more generally known throughout the country than the two former, and is much prized: whilst, from the recommendation of Mr. Sheriff, I applied to Mr. Hope, of Fenton Barns, Haddington, for the fourth sort, which had been raised from a seedling discovered by Mr. Hope, senior, in a stone-quarry. This wheat is already celebrated in Scotland for its wonderful produce; it grows very uneven, many stalks not rising above three feet from the ground, whilst others attain four, five, or more. Of this wheat I received the subjoined notice from Mr. Hope:—

"As I understand you are to sow it by way of trial against the prize wheat of the Royal Agricultural Society, I may give you a short history of it. A number of years ago it was observed growing in an old quarry by my father, who was struck with the stiffness of the straw: there were three heads from one stem, which were properly saved and propagated. It is quite a distinct variety from anything known in this quarter. The straw is shorter than most kinds, but remarkably stiff, and weighing per acre as heavy as taller sorts, while the increase of grain grown is generally equal to the rent of the land. A person unacquainted with it would scarcely expect this when looking at it growing, the heads being unequal, some of them being 2 feet higher than others."

The field which I chose for carrying out the experiment was on the side of a hill, facing N.N.W.; the character of the soil a rich loam, inclining in some places to marl, of considerable depth, except on the summit of the slope, where it was stony. It was a one-year-old clover ley, which had been once mown, and afterwards fed by sheep. The controversy between the merits of thick and thin sowing having been carried on at considerable length between the advocates of the different systems, as perfectly unprejudiced in favour of either, I determined to try both; and Lord Ducie having undertaken the manufacture of Newberry's dibbling-machine, an opportunity was offered of putting in a small quantity of seed with the best constructed implement of the kind. Previously to making use of the machine, however, it was tested in a grass-field, when it was found that it deposited in each hole

made by the dibbles from two to six grains, rarely, if ever, exceeding the last number. Several agricultural friends were present at the working of the implement; and as a wish was expressed that the smallest quantity of seed per acre which the dibbling-machine could deposit should be sown, it was set at 2 pecks per acre. I think, however, that it would not be out of place here to state that the system of thin sowing is by no means a novelty; and that if the late Lord Leicester considered 3 bushels of seed per acre as necessary to ensure a good crop of wheat, there were others who thought that a tenth, or even less than that quantity, would lead to a similar result; whilst, without doubt, the saving of wheat consequent upon such a reduction of seed used could not be considered but of national importance. I met lately with a work upon agriculture written by C. Venlo, and published at Winchester in 1773, from which, even at the risk of being tedious, I cannot resist giving an extract, as the writer appears to have been a thoroughly experienced agriculturist, and in practical and theoretical knowledge considerably advanced beyond the agriculturists of that period.

"In 1764 the author instituted an experiment to find out the true distance or quantity of land that wheat ought to have to grow upon. In his own language, it appears that he had invented a machine which harrowed, sowed, and rolled at the same time; and which, as it would sow any quantity of grain on an acre the broad-cast way, the author made a trial of sowing wheat thin on the ground; he accordingly fixed upon a field of 15 acres, which had three different sorts of land in the length of the ridge, which was 40 perches long. One end of the field lay low; the soil was a strong loamy clay; the middle was a high hill, the soil at top was a kind of clay-gravel, very shallow, and mixed with a middle-sized paving stone. The other end was not so low as the first, neither was it so strong a clay, but was what we call a loamy sand: upon the whole it was very good wheat-earth; but the bottom of the field was rather more so. The top of the hill was more proper for barley than wheat. The field had been fallowed for two years, in which time it had got only seven ploughings, which—if I had had the management earlier, as I had not—should have been at least twice as many. Upon the whole, it was in good order, and by far a better fallow than the common run. I gave it a thin top-dressing of wet turf-ashes (for I had no other), and harrowed them in with the seed. On the 15th of February I sowed 14 oz. on one ridge, which, according to the measurement of the ridge, was at the rate of 10 lbs. to the acre; on the other ridge I sowed 28 oz., which according to measurement was at the rate of 20 lbs. to the acre. The ground was very wet, and the horses sunk as far as the plough went: however, the seed was not trod in, because it was sown between the harrow and the horses' feet; but the harrow could not come over it the second time without making the ground in mortar, so that it was only harrowed once in a place; therefore, I am clear, more than half the seed lay bare and uncovered, but as the ground and the weather was wet, it soon vegetated, and most of it grew."

The author then enters into his theory of the shooting of wheat, and states "that in rich, clean, good, well-tilled land, a plant of wheat may shoot to fill 18 inches square; yet I choose to fix my standard to 1 foot

square in good land, as that will bring forth to maturity from 20 to 30 ears, which I found to be as many as had sufficient room to grow out of one sort. As to the ridge which was sown at the rate of 20 lbs. to the acre, it was impossible to find a root with above 17 ears at it in the best part of the land, and so in proportion in other parts. This was the most convincing thing of all to the reapers and bystanders, who were all helping to seek, and they found more on the thin-sown ridge, at 30 ears and upwards on one sort, than on the other ridge at 17 ears to the root."—"The crop was late before it was ready to reap, it was the latter end of October; it happened to be a fine dry time, or it is a doubt to me, if it had been wet, if it would have ripened well at all, for it was sown too late, and was still put back by having to branch out. 'No pickle used:' and I had from the piece of ground sown with 10 lbs. of wheat, 53 stone 5 lbs. of the finest wheat I ever saw. Every sheaf yielded a stone or upwards, but the sheaves were made large. The produce was at the rate of 32 bushels per acre."

Upon further search I discovered a plate in this work, which might be the original from which Newberry's dibbling-machine was formed; from this drawing, and from the information given in the description of it, it appears to have either simply acted as a dibbling-machine or to have performed the double office of dibbling and sowing.

Begging pardon for this digression—which, however, I do not think will be uninteresting to some of the readers of this Report—I now proceed with my details.

Four different quantities of seed were used per acre:—viz., in the drilled wheats, 2 bushels, and 1 bushel and 3 pecks; in the dibbled wheats, 2 pecks, and 2 pecks and 1 quart—the addition of the 1 quart of seed to the dibbled portion of the wheat was consequent upon the unfavourable state of the weather at the time the seed was deposited.

The wheats were put in as follows:—

1. Jonas' prolific seedling.
2. Red-straw white.
3. Hopetown.
4. The Southampton, called the Brittany, or Breendon white wheat.
5. Fenton.

On Tuesday, the 5th of November, all the wheats were drilled in except the Fenton, which had not arrived from Scotland. On the Friday following we began using the dibbling-machine; much rain fell during the day, and all that night, so that the ground was in a very indifferent state for working the machine; the draft was great, and against the hill it was as much as four good horses could do: the machine, however, though far from perfect, seemed to deposit the seed tolerably regular; but the land carried so much, that even with the recent improvements there was some difficulty in clearing the dibbles of the soil which at every revolution adhered to them.

The Fenton wheat having arrived on Friday, the drilling and dibbling was finished on Saturday morning. An acre was allotted to each of the drilled, half an acre to each of the dibbled wheats. On the 16th I find the first drilled wheats were up, and the Fenton and dibbled wheats were germinating. On Friday, December 6th, the thermometer

stood 10° below the freezing point; on the 21st the frost began breaking up, with cold winds from the N.N.E. and E.S.E., when the dibbled and late drilled wheats were considered in a critical state, not having arrived at a full green blade: little or no damage however occurred. In February the dibbled wheat, though very thin, still very clearly indicated the different rows; but towards the latter end of March we had sharp frosts and biting winds, when on the lighter land on the hill many plants perished, and then it was that the thick sowing showed to advantage, as from the paucity of plants in the dibbled wheats none was left to make good the deficiency caused by the inclemency of the weather at that particular time, when the wheat is most susceptible of injury from climate, whilst in the drilled wheats, though many plants perished, yet was there a sufficiency left to ensure a crop; indeed, under the most favourable circumstances of the atmosphere for the growth of wheat, I could never recommend so small a quantity of grain to be sown as that I experimented upon, without the precaution of a seed-bed being adopted, from which the grower might be enabled to fill up the vacancies occasioned by numerous accidents. Immediately the frost broke up a very heavy roller was passed over the ground. I hoed the whole of the field once, as in this trial I considered it necessary that the whole of the wheats should be subjected to the same treatment, so that the simple inquiry, upon the results of the crop being ascertained, might be, which system paid best. The one hoeing with the drilled wheats proved sufficient to ensure me a good clean stubble, whilst, owing to the paucity of plants in the dibbled portion of the field, the filth was excessive, which will occasion at least double labour in preparing it for the root crop next season. On the 5th of April I noted that in appearance Nos. 1, 2, and 3 stood first, without any perceptible difference in superiority; No. 5, second; No. 4, third: indeed, throughout the winter, the latter wheat appeared more delicate in habit and was thinner on the ground, and had lost more plant than the others. The dibbled wheats were regarded as a failure, as there was not supposed to be sufficient plant to ensure a crop. No. 1 drilled with 1 bushel and 3 pecks will do. From an accident which occurred to me, I was not enabled to attend to the progress of the experiment as well as I could have wished; but three friends reported to me on the 22nd of June that the plants on the dibbled part were looking much stronger than those on the drilled, although thin on the ground, and that the whole field was looking exceedingly well, although Nos. 1, 2, and 3 still maintained their superiority. On July 26th I found upon careful examination the wheats, with the exception of some trifling rust, were looking well; and by a very good agriculturist who accompanied me in the survey, the produce of the wheats were estimated at—

Drilled.		Dibbled.	
No. 1.	41 bushels per acre.	No. 2.	36 bushels per acre.
2.	41½ ,,	3.	34 ,,
3.	43½ ,,	4.	30 ,,
4.	41 ,,	5.	37½ ,,
5.	42 ,,		

At this time No. 1 was much laid, as well as a small part of No. 2; all the others stood well. From the 2nd to the 11th of August we had heavy and continuous rains, at which time No. 1 was beaten flat; a considerable part of No. 2 was down; No. 3 was not so much affected; whilst Nos. 4 and 5 stood upright. The dibbled wheats were in no way affected by the weather; whilst the wheat drilled at 1 bushel 3 pecks per acre at the lower end of the field, in the deep soil, was prostrate.

From the state of many of the pieces I found it quite impossible, without serious injury to the produce, to mow the crop, and therefore, on the 19th of August, began reaping No. 1, but was interrupted by rain for 24 hours. On the 22nd I finished 1 and 2; on the 23rd, 5; on the 25th, 3 and 4. As there appeared every chance of a catching harvest, on the 29th I housed No. 1 and 2 in the barn; but as the weather took up immediately afterwards, I left 3, 4, and 5 till the 2nd of September, when I stacked them in the field. The dibbled wheats were still very green; but from the quantity of small birds which infested the field, it was necessary to cut it, which I did on the 30th of August, and housed all on the 5th of September, on which day the experimental field was cleared of the dibbled wheats, as I conceive prematurely, for they were not in a condition either for the barn or stack, but the weather was so threatening, joined to the havoc committed by the birds, as to determine me to save what I could, without much reference to condition. In my selection of pieces from each of the trial wheats to be thrashed and measured, I took an undeviating line throughout the field, avoiding as much as I could those parts which were much laid; but this was impossible, as far as No. 1 was concerned, as the whole of it was nearly flat. My intention had been to have carried out this experiment as fully as I did that of 1841, and to have reported not only on the quantity of grain and straw produced from each variety, but likewise the quantity of flour produced from a given weight of each; the varying circumstances, however, from the changeable state of the weather under which the different wheats were housed, precluded the possibility of this being fair, and I therefore merely weighed the wheat and straw, the results of which the following table will indicate:—

DRILLED WHEATS.

Quantities sown per Acre.	Numbers of Wheats.	Weight per Bushel.	Produce per Acre, estimated from about one-third of an Acre, measured, reaped by hand, and thrashed by hand.		Weight of Straw per Acre.
			Head.	Tail.	
B. P. Q.		lbs.	B. P. Q.	B. P. Q.	Tons cwt. qr. lb.
2 0 0	1	60	48 0 0	7 2 0	3 2 2 26
2 0 0	2	59	42 2 0	4 0 0	2 2 0 21
2 0 0	3	61	47 0 0	7 1 0	2 9 2 21
2 0 0	4	60	35 3 0	4 3 0	2 0 0 10
2 0 0	5	62	49 0 0	5 0 0	2 2 2 13
			Estimated from one-fifth of an Acre, treated as above.		
1 3 0	1	59	31 2 0	2 2 0	2 0 3 11

DIBBLED WHEATS.

Quantities sown per Acre.	Numbers of Wheats.	Weight per Bushel.	Produce per Acre, estimated from about one-sixth of an Acre, treated as above.						Weight of Straw per Acre.
			Head.			Tail.			
B. P. Q.		lbs.	B. P. Q.			B. P. Q.			Tons. cwt. qr. lb.
0 2 0	2	58	21 3 2			3 0 2			1 0 2 4
0 2 1	3	58	30 2 0			4 1 0			1 12 3 0
0 2 1	4	59½	19 1 0			2 3 0			0 19 1 14
0 2 1	5	60	34 1 2			6 1 0			1 13 2 11

The Southampton wheat in this trial, therefore, so far from turning out well, has, both in the drilled and dibbled portions of the field, produced a considerably less quantity of grain than the other sorts; it likewise appeared more delicate in habit, and therefore cannot be recommended for general use.

The Fenton wheat, though when drilled yielding less than either No. 1 or 3, yet when dibbled at 2 pecks 1 quart per acre, produced 5 bushels 3 pecks 2 quarts more than No. 3, and 3 bushels 2 pecks 2 quarts more than No. 1, drilled at 1 bushel 3 pecks per acre; and notwithstanding the severity of the rains and wind after the wheats came in ear, stood perfectly upright at the time of reaping. I cannot but consider this a valuable species; and though not quite on this occasion justifying the very high eulogium pronounced on its merits by Mr. Hope, yet well worthy of general cultivation. Nos. 1 and 3 fully kept up their reputation, whilst in its produce No. 2 was large.

Notwithstanding the dibbling in this trial must be considered, as far as regards Nos. 2 and 4, a failure, yet I cannot but state my thorough conviction, that upon light flat land, free from stones, this system ought to be universally adopted. I should, however, recommend not less than a bushel to be dibbled per acre, and that the process should take place earlier in the season, as when, from the quantity of grain sown there cannot be a superabundance of plant, it is of great moment that it should be fully established before the alternations of frost and thaw commence. The tillering of the plants is extraordinary, as well as the strength of the straw, and what is saved in seed may be most beneficially applied to keeping the land perfectly clean, with advantage to the labourer and certain profit to the cultivator. If, indeed, we take two instances of the same species of corn from the above tabular results, we cannot fail to be struck with the much greater return from the small than from the large quantity sown—for instance, I find that No. 2, drilled at 2 bushels per acre, produced 46 bushels 2 pecks; whilst No. 2, dibbled at 2 pecks per acre, gave, say 25 bushels per acre. Two pecks of seed, however, were only tried in the latter, whilst four times that quantity was used in the former case; proportionally, therefore, instead of 46 bushels 2 pecks, it should have given 100 bushels. I throw out these hints for serious consideration, as without doubt such a saving of seed as the general introduction of the dibbling-machine would produce must be esteemed of national importance. The machine

is too high-priced for the general use of farmers; but when located in different parts of the country, and let out for hire, I cannot but recommend a trial upon the description of light soil to which I have before alluded.

Kingsweston, November 26th, 1845.

W. MILES.

IX.—*Report of Prize White Wheat, selected at the Southampton Meeting of the Royal Agricultural Society, 1844, and two other sorts sown on the Right Hon. Earl Spencer's farm at Chapel Brampton, Northampton.*

No. 1. A red wheat, called Rattling Jack, bought of Mr. Redgrave, Boughton, near Northampton.

„ 2. The white prize wheat, from Southampton, 1844.

„ 3. A red wheat, called the Victoria Red, bought of Mr. Potterton, Stow, Nine Churches, near Daventry, Northamptonshire.

All sown October 28th, 1844, on strong soil—clay subsoil, after vetches, part taken off and limed 20 qrs. per acre.

No.	Name of Wheat.	When Sown.	When it came up.	When Cut.	When Carried.
1	Rattling Jack, Red	Oct. 28th.	Nov. 16th.	Aug. 30th.	Sept. 11th.
2	White Prize Wheat from Southampton, 1844.	Oct. 28th.	Nov. 20th.	Sept. 11th.	Sept. 17th.
3	Victoria Red Wheat	Oct. 28th.	Nov. 20th.	Sept. 5th.	Sept. 20th.

QUANTITY AND QUALITY OF PRODUCE.

No.	Name of Wheat.	Quantity Sown.	Produce Good.	Produce Tailing.	Total per Acre.	Weight of Straw.
1	Rattling Jack, Red.	Qrs. bu. glls. 2 1 1	Qrs. bush. 4 1 59 lbs. per bushel.	Bush. 5 50 lbs. per bushel.	Qrs. bush. 4 6	lbs. 3214
2	White Prize Wheat from Southampton, 1844.	Qrs. pks. glls. 2 0 1	Qrs. 3 55 lbs. per bushel.	Qrs. bush. 1 3 50 lbs. per bushel.	Qrs. bush. 4 3	lbs. 2771
3	Victoria Red Wheat	Qrs. pks. glls. 2 0 1	Qrs. bush. 4 2 56½ lbs. per bushel.	Bu. pks. 6 1 51 lbs. per bushel.	Qrs. bu. pks. 5 0 1	lbs. 3500

SPENCER.

X.—*On Deep Draining.* By the Right Hon. C. ARBUTHNOT.

To Mr. Parkes.

MY DEAR SIR,—In the early part of this year I furnished you with an account of the draining a paddock of seven acres, to the depth of four feet; and I informed you that these seven acres, having been previously very wet, had become quite dry after being thus drained. At the same time I told you that my success in that first experiment had determined me to treat in the same way other parts of my farm.

I have accordingly since drained, to the depth also of four feet, a field of ten acres, which had always been under the plough; and from the surface of which, water did not for a considerable time disappear after heavy rain.

It had, I know, been objected to my experiment of four-foot drains, in the paddock of seven acres, that the shallow drains, which as I stated had previously been placed there, might have had the effect of facilitating the escape of the water from the land. Whether the shallow drains had such an effect I cannot pretend to say. At all events, it was satisfactory that the ten-acre field had never been drained at all; so that a perfect trial could be made of your system of placing drains much wider apart, and at a considerably greater depth than had been the usual, and I believe I may add, the universal practice.

The ten-acre field is now drained, and the effect is as complete as the seven acres. Previously, the rain did not penetrate the earth, but ran in great part off the surface, carrying with it vast quantities of the finest soil, and filling the ditches. This does not happen now; the rain-water sinks through the earth, and issues from the drains perfectly clear, being well filtered in its passage. Although I am an eye-witness of the effects produced by this drainage, I prefer giving you the following account sent to me by my bailiff, Andrew Thompson, after heavy rains. It is the more satisfactory, as he was originally, as I mentioned, somewhat startled at the idea of laying drains four feet deep, but is now become a complete convert to your system of draining, and he writes as follows:—

“The drains in the ten acres run capitally. They were running very fast yesterday morning, and have continued running ever since. The four-foot drains in the paddocks also run well. They were, like the ten-acre field drains, throwing out of their main vast quantities of water. The shallow drains in all the fields were running yesterday also; but as the rain fell in the night time, I cannot tell whether the deep or the shallow drains began to run first. I have no doubt the deep ones began first. I was very particular in examining the action of most of the drains on the farm. It was plain to see that the deep drains were carrying off more than double the quantity of water carried off by the shallow drains; and, at this moment, the deep drains are discharging most water. The ten-acre field is now in excellent condition as to dryness. The middle of the space between the drains was wet yesterday morning, but this morning I found it dry. This plainly shows that the deep drains draw the water from a distance of 22 feet and upwards. Mr. Parkes, when examined before a committee of the House of Lords

this year, stated, 'that he should be satisfied if, after twelve hours of continuous rain, all the water were carried off in forty-eight hours afterwards.' I have no doubt but the drains in the ten-acre piece, although this is their first season of action, will run the water out of the land in that time. The more instances I see of deep-drainage, the more I am convinced of its efficacy."

I shall now proceed to give you an account of the expense incurred ; stating separately the cost of digging, and that of the pipes employed ; and then inform you of what the whole sum laid out on the ten-acre field amounted to.

The expense of digging the drains has been 24*l.* 18*s.* 6*d.* One hundred and thirty-one chains (2882 yards) were dug at 3*s.* 6*d.* per chain ; and eight chains (176 yards) at 5*s.* per chain ; these eight chains being for a very deep main drain pierced through rock.

The pipes cost 13*l.* 15*s.*, as will be seen in detail below :—

1000 Main drain pipes	. . .	£1 15 0
6200 Small do. at 25 <i>s.</i>	. . .	7 15 0
4250 Small do. at 20 <i>s.</i>	. . .	4 5 0
		<hr/>
		13 15 0

The whole cost of the drainage amounts therefore to 38*l.* 13*s.* 6*d.*, or 3*l.* 17*s.* 4*d.* per acre.

It will be necessary for me now to explain why the expense has been so much beyond what, as I once told you I believe, I had anticipated. I remember your saying that extreme cases did occasionally occur, in which the expense would exceed the previous expectation ; and my ten-acre field, in consequence of rock, has been one of those cases. Had there been no rock to break through, as was the case in that part of the ten-acre field first drained, the cost of drainage would have scarcely exceeded, digging and pipes included, the original estimate of about 30*l.* But as the work proceeded farther, it was found that rock was incessantly to be removed by the pickaxe ; and at last there was scarcely any land dug without the intervention of rock.

The width between the drains is in most parts 45 feet ; but where the land is flat, there being also hollow places in the field, it was found necessary to vary the width ; some drains being 15 feet asunder, and others placed at a much farther distance. I may here as well mention that the upper soil is of a clayey texture, and of a dark brown colour ; and the subsoil consists of a very strong clay.

I had long been aware that shallow draining did not lay strong and wet land sufficiently dry. I was fearful that throughout the whole country great labour had been bestowed, and great expense incurred, without the intended effect of drying the land being sufficiently produced.

You have the merit of introducing a system into public use which, if properly tried, will, I doubt not, be approved ; and my conviction is that sooner or later all agriculturists will come to the same conclusion that I have.

I am, dear Sir,

Very sincerely yours,

Woodford, 3rd December, 1845.

CHARLES ARBUTHNOT.

XI.—*Analysis of a Marl which, having been used for Manure, rendered the subsequent Application of Bones inoperative.* By Dr. LYON PLAYFAIR.

To the Secretary.

SIR,—A considerable time since a “marl” was sent to me by the Council for analysis, the peculiarity of the so-called “marl” being, that it might be supposed to exert the same action as bones, as these produced no effect where this substance had been applied. I communicated the result of the analysis at the time it was made, but regret to find that I never officially described it to the Society, although I gave an account of it in the last lectures I had the honour to deliver to the Society.

The substance is, properly speaking, a chalk, for the term “marl” necessarily implied the existence of a considerable amount of alumina. In the portion of substance sent to me for analysis, there is only about one-twentieth of a grain of phosphoric acid in 100 grains, or every 100 tons of the substance would contain about 224 lbs. of bone earth. As this is not a very large proportion, I dare not venture to accede to the opinion that its beneficial action, as a manure, is due only to its phosphoric acid; but to enable you to judge for yourself, I subjoin all the constituents in the chalk sent to me for examination.

Moisture	0·70
Carbonate of lime	95·50
Silica (partly united with potash)	0·51
Protoxide of iron	1·70
Alumina	0·64
Sulphate of lime	0·37
Phosphate of lime (as bone earth)	0·10
Carbonate of magnesia	0·19
Chloride of sodium	0·13
Potash	traces
Loss on analysis	0·16
	<hr/>
	100·00

Sir, I have the honour to be,
Museum of Economic Geology, Your faithful Servant,
 7th July, 1845. LYON PLAYFAIR.

XII.—*On the Application of Liquid Manure to a new variety of Italian Rye Grass.* By W. DICKINSON.

To the Duke of Richmond.

MY LORD DUKE,—I beg to send your Grace a report of my mode of cultivating Italian rye grass as food for my horses, the success of which has astonished me very much, and which I am anxious to make known for the general welfare of agriculturists at large.

My land—a strong clay, in good heart, and under-drained—is finely pulverized during the summer months after tares or any early crop of corn, is sown broadcast with 4 bushels per acre of seed, grown by myself *without weed*, harrowed very lightly with bushes; iron harrows bury the seeds too deeply; if weeds grow they are pulled, and the grass stands for a crop, which, in 1844, was cut the first time the first week in March, with about 10 inches of grass;

April 13th, it was cut the second time;

May 4th, the third time;

May 24th, the fourth time;

June 14th, the fifth time;

July 22nd, the sixth time, with ripe seed and 3 loads of hay-straw to the acre.

Immediately after *each* of these crops the land was watered once from a London street-watercart, with two parts of pure urine from the stables and one part of water; the produce of each crop increasing with the temperature of the atmosphere, from three-quarters of a load per acre, as hay, to 3 loads per acre. The crop having shed a quantity of seed, I was doubtful the urine might injure its growing, so discontinued to water, but well harrowed it with iron harrows and left it, expecting nothing more from it; it produced, however, 3 or 4 (I believe 4) light crops afterwards; and has now standing upon it again 3 loads to the acre, the third crop for seed—

1845: My first cutting this year was not till April 6th;

Second, May 3rd;

Third, June 9th;

Fourth, 2½ feet long, now standing on the land.

I have since covered the land *well* with the plant, from 2 bushels of seed per acre, sown from a broadcast drill, of Mr. Smart's, 369, Oxford Street, which, from the average price of 10s. per bushel for the seed, pays the cost of the drill (3l. 10s.) immediately, besides a more evenly sown plant; and may be sown in windy weather; which cannot be done by the hand.

I think it necessary to observe, from my own experience, Italian rye grass differs as much in quality and variety as English rye grasses or English fruits. There are Italian rye grasses that bloom at 1½ feet high; and that I grow, as your Grace has seen, stands from 4 to 5 feet. Any further information that may be required, so far as I am able, shall be given to any one wishing to grow the plant. I attach a letter sent me by a practical farmer whom I supplied with seed for an acre, which will furnish interesting information to sheep graziers.

I beg the honour to subscribe myself, my Lord Duke,

Your Grace's very humble servant,

WILLIAM DICKINSON.

Curzon Street, Mayfair, London, July 12th, 1845.

MY DEAR SIR,—With the Italian rye grass seed I had of you I sowed about one acre the first week in September last; after a crop of Spring tares the ground was manured with about 10 tons of good horse-dung.

The second week in April I began to feed it off with ewes and lambs, and they made very quick progress, especially the lambs, the grass producing an abundance of milk. There were 42 couples, and the grass supplied them three weeks, giving the ewes chaff and oats, and the lambs peas. After this they began to feed it again for want of other food.

I took them off the grass on the 13th of May, and on the 18th of June we mowed the whole for hay, which produced nearly 2 loads per acre. This was about five weeks' growth. I should not have pursued this plan had I not had tares which I wanted off the land to sow it with swedes.

The grass is now growing freely, but not so fast as after feeding off. I want your water-cart.

I am quite satisfied of its being the most valuable plant I know of, especially for early spring feed; it comes to perfection for feed quite as early as rye, and the comparison between the two for feeding qualities is as 10 to 1 in favour of the Italian rye grass.

I am so well satisfied of its goodness that I intend sowing a much larger breadth in the ensuing autumn after wheat.

Yours truly,
J. HUNT.

Hayes Gate, near Uxbridge, July 1st.

XIII.—*Analysis of the Soil and Subsoil of a very Productive Field near Sutton, in Norfolk.* By Dr. LYON PLAYFAIR.

To the Secretary.

SIR,—I had the honour to receive from you two portions of soil, described as the surface soil and subsoil of a very productive field near Sutton, Norfolk. According to the request of the Council of the Society, these portions have been separately subjected to a rigid analysis: and before making any remarks on the results thus obtained, I place for the information of the Council the analysis in two forms, one of these giving the actual statement of the analysis, the other indicating the probable method in which the ingredients are associated in the soil.

1.—*Surface Soil.*

In 100 parts as actually found.		In 100 parts as contained in the soil.	
Organic matter	2.43	Organic matter	2.43
Hydrate water	2.60*	Hydrate water	2.60
Carbonic acid	0.92	Silica and silicic acid	78.27
Sulphuric acid	0.09	Peroxide of iron	3.41
Phosphoric acid	0.38	Carbonate of lime	2.10
Silicic acid and silica	81.26	Sulphate of lime	0.15
Peroxide of iron	3.41	Phosphate of lime (as in bones)	0.08
Alumina	3.58	Phosphate of magnesia	0.58
Lime	1.28	Magnesia (probably as a silicate)	0.88
Magnesia	1.12	Alumina (probably as a silicate)	3.58
Potash	0.80	Silicate of potash	1.58
Soda	1.50	Silicate of soda	3.71
Chlorine	a trace	Chlorine (in combination as salt)	a trace
Loss on analysis	0.63	Loss on analysis	0.63
	100.00		100.00

* Water which is not driven off at the boiling point 212°.

2.—Subsoil.

In 100 parts as actually found.		In 100 parts as contained in the soil.	
Organic matters free from ammonia	1·20	Organic matter free from ammonia	1·20
Hydrate water	2·60*	Hydrate water	2·60
Carbonic acid	0·04	Silica and silicic acid	81·96
Silicia	82·55	Peroxide of iron	3·70
Peroxide of iron	3·70	Carbonate of lime	0·09
Lime	0·69	Lime (probably as silicate)	0·58
Magnesia	1·55	Magnesia (probably as silicate)	1·55
Alumina	4·48	Alumina (principally as silicate)	4·48
Potash	0·60	Sulphate of lime	0·27
Soda	1·10	Chloride of sodium	2·08
Chlorine	1·26	Silicate of potash	1·19
Sulphuric acid	0·16	Phosphoric acid	mere trace
Phosphoric acid	a trace	Loss on analysis	0·30
Loss on analysis	0·07		
	100·00		100·00

* Water not expelled by long-continued exposure to a water bath.

The subsoil may be viewed as representing the soil in its natural condition, and, as such, is rich in every constituent essential to fertility, with the exception of phosphoric acid, of which substance scarcely a trace could be detected. All the iron in the subsoil exists in the state of peroxide, so that the plants may appropriate its constituents without injury. The presence of so much common salt in the subsoil is only explicable on the supposition that it has been washed by the rains from the upper to the lower soil, for we find it absent except as a trace from the surface soil. The vicinity of the soil to the sea explains the origin of the salt.

The upper soil has obviously been improved by manure containing phosphates, and perhaps also of silicates. I regret that no information on this point accompanied the letter from the Secretary of the Stalham Farmer's Club.

The soils, from the presence of the alkalies and alkaline earths, and of all the proper acids, with the exception of phosphoric acid in the subsoil, are admirably calculated to furnish plants with their proper food.

Sir, I have the honour to be,

Your obedient and faithful Servant,

Museum of Economic Geology, Craig's Court, LYON PLAYFAIR.
Charing Cross, 7th July, 1845.

XIV.—On the Jerusalem Potato or Artichoke (*Helianthus tuberosus*).

[From 'Boussingault's Rural Economy.']

"This plant is generally believed to be a native of South America, but M. de Humboldt never met with it there, and according to M. Correa, it does not exist in Brazil. The property which the tubers of this plant have of resisting the cold of our winters, and several botanico-

geographical considerations, lead M. A. Brongniart to presume that the plant belongs to the more northern parts of Mexico.

"The Jerusalem artichoke rises to a height of from 9 to 10 feet; it flowers late, and I have not yet seen it ripen its seeds. It is propagated by the tubers which it produces, and which are regarded, for good reason, as most excellent food for cattle; in times when the potato was not very extensively known, it also entered pretty largely into the food of man; when boiled, its taste brings to mind that of the artichoke, whence the name.

"The tuber of the Jerusalem artichoke, from an analysis of M. Braconnot, appears to contain in 100 parts:—

Uncrystallizable sugar	14.80
Inuline	3.00
Gum	1.22
Albumen	0.99
Fatty matter	0.09
Citrates of potash and lime	1.15
Phosphates of potash and lime	0.20
Sulphate of potash	0.12
Chloride of potassium	0.08
Malates and tartrates of potash and lime	0.05
Woody fibre	1.22
Silica	0.03
Water	77.05
	<hr/>
	100.00

M. Payen found a larger proportion of sugar in this tuber than that stated above, and he ascertained that the fatty matter consists chiefly of stearine and elaine. In the Jerusalem artichoke I myself found:—

Of dry matter	20.8
Water	79.2
	<hr/>
	100.0

"One trial for azote would lead me to conclude that M. Braconnot had estimated the albumen too low in his analysis, or, as is more probable, that several azotised principles had escaped him. The dried tuber gave me 0.16 of azote, a number which would indicate 1.0 as the proportion of vegetable albumen. There are few plants more hardy and so little nice about soil as the Jerusalem artichoke; it succeeds everywhere with the single condition that the ground be not wet. The tubers are planted exactly like those of the potato, and nearly at the same time; but this is a process that is performed but rarely, inasmuch as the cultivation of the helianthus is incessant, being carried on for many years in the same piece; and after the harvest, in spite of every disposition to take up all the tubers, enough constantly escape detection to stock the land for the following year, so that the surface appears literally covered with the young plants on the return of spring, and it is necessary to thin

them by hoeing. The impossibility of taking away the whole of the tubers, and their power of resisting the hardest frosts of winter, is an obstacle almost insurmountable to the introduction of this plant, as one element in a regular rotation. Experience more and more confirms the propriety of setting aside a patch of land for the growth of this productive and very valuable vegetable root.

"Of all the plants that engage the husbandman, the Jerusalem artichoke is that which produces the most at the least expense of manure and of manual labour. Kade states that a square patch of Jerusalem artichokes in a garden was still in full productive vigour at the end of thirty-three years, throwing out stems from 7 to 10 feet in length, although for a very long time the plant had neither received any care nor any manure.

"I could quote many examples of the great reproductive power of the helianthus; I can affirm, nevertheless, that in order to obtain abundant crops, it is necessary to afford a little manure. I shall show in another chapter, however, that this is manure well bestowed.

"Like all vegetables having numerous and large leaves, the helianthus requires air and light; it ought, therefore, to be properly spaced. The original planting, of course, takes place in lines, but in the succeeding crops, and those which are derived from small tubers accidentally left in the ground, the order is, of course, lost; it is only necessary to destroy a sufficient number of the young sprouts which show themselves in the spring, to leave those plants that are preserved with a sufficient space between them. When the plants are somewhat advanced, the ground should receive one or two diggings with the spade, and a hoeing or two to destroy weeds.

"The leaves of the helianthus are used in many places as forage, the stems being cut a few inches from the ground; the gathering takes place at different periods of the year, but probably to the detriment of the tubers; it may be lucrative to destine the leaves for the nutriment of cattle, but I believe we have to choose between the green crop and the crop of tubers. It is unquestionable that the premature removal of the green stems must prove injurious to the roots; in my own farm the leaves are never removed, and my opinion is that it is vastly more advantageous to depend upon the crop of tubers alone. The tubers are gathered as they are wanted; for not dreading the frost, they may remain in the ground the whole of the winter; they do not require, like the potato, to be collected and pitted at a certain period; they require no particular situation, no particular care for their preservation; the only disadvantage that accompanies their being left in the ground is that during very hard frosts the labour required to get at them is very great. During winter the woody stems of the plant die and dry up; they are then useful as combustible matter; but a better use of them, perhaps, is to make them enter in certain proportions into the litter of the hog-stye; the pith there absorbs a large quantity of the liquid manure. Schwertz estimates the mean quantity of dry leaves and stems at 3 tons, 1 cwt., 1 qr., and 13 lbs. per acre. The following quantities of tubers have actually been gathered in Alsace on one acre:—

	Tons.	Cwts.	Qrs.	Lbs.
Sandy soils	4	3	3	6
Soils of the best quality	10	8	3	13
At Bechelbroun (mean)	10	16	0	8
Bechelbroun crops of 1839-40	14	8	2	27 "

Note.

In our present uncertainty with regard to the future yield of potatoes, it occurred to me as well as to Dr. Playfair that the Jerusalem artichoke might be worth the attention of farmers, at least as food for stock, being a common crop in Alsace. They are a kind of sunflower; and sunflower being in Italian *Girasole*, has been corrupted into the word Jerusalem, whence soup made with this vegetable is absurdly called *Soupe à la Palestine*. M. Boussingault further states that he gives his ground about 9 tons of dung every other year, for which he obtains 20 tons of roots, or 10 tons each year. This is equal to a good average crop of common potatoes. The next question is as to the nutritive qualities of this root. In this respect M. Boussingault places it in the same rank with potatoes, not only on theoretical grounds, but also from direct experiment, in using them as food for horses, to whom they were given undressed with perfect success. They seem to be worth a trial for stock, but I think that when boiled they are too watery to take the place even of potatoes as food for man.—PR. PUSEY.

XV.—Comparative Trial of Superphosphate and Guano.

By R. D. DREWITT.

To the Secretary.

DEAR SIR,—I forward the promised statement of the result of my experiments with guano, bones with sulphuric acid, &c., as regards their application for turnips. The whole process was carried out under my personal superintendence; I can, therefore, speak very confidently as to the accuracy of the details.

Yours truly,
R. D. DREWITT.

James Hudson, Esq.

*Pepperering, near Arundel,
January 9th, 1846.*

STATEMENT.

Number of Experiment.	Description of Manure.	Produce.	Produce	Cost of Manure per Acre, including in each case 10 Loads of Dung, at 2s. 6d.	Remarks.
		of Roots per Acre.	of Leaves per Acre.		
		Tons. cwt. lb.	Tons cwt. lb.	£. s. d.	
1.	3½ cwt. African guano, 5 bush. turf ashes, sown together by hand after once harrowing; then twice harrowed and rolled before the drill. 200 bushels of superior dung.	9 12 24	0 16 48	2 15 9	Before the 9 separate acres were set out, 10 loads per acre of excellent dung had been applied to the whole in favourable weather.—The 9 acres were drilled with the green-topped swede, on the 5th June, 1845, and the crop was weighed on the 22nd of Dec. More ashes were drilled on No. 2 than applied to No. 1 by hand. The advantage of the extra 20 bushels of ashes can be estimated by a comparison between Nos. 8 and 9.
2.	3½ cwt. African guano, 25 bush. turf ashes, drilled together. Dung as above.	13 1 0	0 17 88	2 18 11	On allowing for this, No. 2 will still prove to be nearly 2 tons better than No. 1.
3.	3½ cwt. Peruvian guano, 25 bush. turf ashes, drilled together. Dung as above.	9 2 16	0 14 68	3 7 8	The Peruvian Guano, No. 3, was obviously much adulterated, which will account in a great measure for the superior effect of the African guano, No. 2.
4.	8 bush. calcined bones, 168 lbs. sulphuric acid, 12 gallons water, 20 bush. turf ashes, drilled together. Dung as above.	17 10 0	1 0 82	3 6 10	The bones, acid, and water in Nos. 4 and 5 were mixed in a water-tight pit, and on the second day put with the ashes and turned up together. In three days it was dry enough to sit and drill.
5.	8 bush. fine bones, unburnt, 168 lbs. sulphuric acid, 12 gallons water, 20 bush. turf ashes, drilled together. Dung as above.	14 15 80	0 19 56	3 10 8	
6.	6 bush. calcined bones, 168 lbs. sulphuric acid, 10 galls. water, 22 bush. turf ashes, drilled together. Dung as above.	17 15 81	1 1 83	3 1 10	The process of preparing No. 6 was much more convenient and simple. The 22 bush. of ashes were first shaped in the form of a basin or mortar-bed, about 6 inches thick at the bottom, and pressed firmly together; the bones were then placed in the basin and the acid poured on them, the water following. Thinking that a waste of acid might ensue, I used the same quantity for 6 bush. of bones as for 8 bush. in Nos. 4 and 5. The acid and water penetrated the ashes very slightly till the mass was turned up together. The solution of the bones was complete. The result of this experiment is very striking.
7.	16 bush. bones*—10 bush. half-inch., 6 do. fine dust—20 bush. ashes, drilled together. Dung as above.	9 7 32	0 14 32	3 10 4	
8.	30 bush. turf ashes, drilled. Dung as above.	5 18 31	0 7 2	1 10 0	Nos. 4 and 6 were ready to hoe five days sooner than Nos. 2 and 5; about eight days before Nos. 1, 3, and 8, and twelve days before Nos. 7 and 9. Nos. 4 and 6 have maintained the lead throughout, Nos. 2 and 5 increasing in a greater ratio.
9.	Dung as above only....	3 10 76	0 4 82	1 5 0	

* The bones were well fermented with 24 gallons of urine.

The small produce on Nos. 8 and 9 will not excite surprise when the nature of the field on which the experiments took place is known. Till the year 1842 it had been for several years an exhausted piece of sainfoin, comparatively out of cultivation from its presumed hopeless sterility. In March, 1842, it was sown with oats, after being well manured. In 1843 again manured for rape, wheat following in 1844. The crops were, as regards straw, very slight; but the produce of wheat was considerable, owing to the redundant yield of 1844. The field will be best described as a long steep brow facing to the west. The soil is very shallow and spongy, resting on a substratum of the upper chalk. A more unfavourable position for the growth of swede turnips cannot well be imagined; and it was merely from local circumstances the spot was selected for the experiments.

[Mr. Drewitt's experiment, which only arrived after the rest of the Journal was printed, remarkably confirms the opinion advanced by me in an earlier part of this number, that, value for value, Superphosphate of lime (for such is the product of bones and sulphuric acid) is on some soils superior to guano as a manure for turnips.—*PH. PUSEY.*]

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Royal Agricultural Society of England.

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Normanby, Marquess of...Mulgrave Castle, Whitby, Yorkshire

Northampton, Marquess of...Castle Ashby, Northamptonshire

†Northumberland, Duke of....Alnwick Castle, Northumberland

†Nott, John...Bydown House, Barnstaple, Devon.

Nugent, Hon. M. W. Bellew...Higham Grange, near Hinckley, Leicestershire

Oldham, F. Oldham...Belle-amour Hall, Rugeley, Staffordshire

Palmer, Robt., M.P....Holme Park, Reading, Berks.

Patten, John Wilson, M.P....Bank Hall, Warrington, Lancashire

†Peel, Right Hon. Sir Robert, Bart., M.P....Drayton Manor House, Fazeley, Staffordshire

†Pendarves, E. W. W., M.P....Pendarves House, Truro, Cornwall

Pennant, Hon. Col. Ed. Gordon Douglas...Penrhyn Castle, Bangor, N.W.

†Percival, John...Woodlands, Ryde, Isle of Wight, Hants

†Perkins, H....Hanworth Park, Hounslow, Middlesex.

Petrie, Hen....Dunkeshalgh, Blackburne, Lancashire

Plowden, W....Plowden Hall, Bishop's Castle, Salop

Pole, R. S. Chandos...Radbourne Hall, near Derby

†Popham, Frns. L....Littlecott, Hungerford, Berks.

†Popham, Genl....Littlecott, Hungerford, Berkshire

†Portman, Lord...Bryanston House, Blandford, Dorsetshire

Powis, Earl of...Powis Castle, Shropshire

Price, Sir R., Bt., M.P....Foxley Hall, near Hereford

Pryse, Pryse...Lodge Park, Aberystwith, S.W.

†Pusey, Philip, M.P....Pusey, Faringdon, Berkshire

Pym, F...The Hasells, Biggleswade, Bedfordshire

Quantock, John...Norton House, Yeovil

†Radnor, Earl of...Coleshill House, Faringdon, Berkshire

Rayleigh, Lord...Terling Place, Witham, Essex

Reid, George...Woodmanstone, Ewell, Surrey

Ricardo, O...Broomsbarrow, Tewkesbury, Gloucestr.

†Richmond, Duke of...Goodwood Park, Chichester, Sussex

Ridley, Sir Matt. White, Bt...Blagdon, Newcastle-on-Tyne, Northumberland

Ripon, Earl of...Nocton Hall, Lincoln

Robertson, A. J...Inches, near Inverness, Scotland

Rogerson, Joseph...24, Norfolk Street, Strand

Rosebery, Earl of...Warren Wood, Hatfield, Hertfordshire

†Rutland, Duke of...Belvoir Castle, Grantham, Lincolnshire

Saint Germans, Earl...Port Eliot, Devonport

St. Quintin, Wm...Seapstone Hall, Scarborough, Yorkshire

†Sanford, Edward...Nyne-Head Court, Wellington, Somersetshire

Scarborough, Earl of...Sandbeck Castle, Bawtry, Yorkshire

†Scholey, W. S...Thurlow Terrace, Larkhall Lane, Clapham

Scott, Jas. Winter...Rotherfield Park, East Tisted, near Alton, Hampshire

Seymour, Henry...Knoyle House, Hindon, Wilts.

Shaw, William...7, King's Road, Bedford Row

Sheridan, R. B...Frampton House, Dorchester, Dors.

†Slaney, R. A...Walford Manor, Shrewsbury, Salop

†Smith, J. A., M.P...Dale Park, Arundel, Sussex

†Sondes, Lord...Elmham Hall, Elmham, Norfolk

Somers, Earl...Eastnor Castle, Tewkesbury, Glostr.

Sotheron, Thomas H. S. B. Esq., M.P...Bowden Park, Chippenham, Wiltshire

†Spencer, Earl...27, St. James's Place

Stanhope, J. S...Cannon Hall, Barnsley, Yorkshire

†Stanley, Lord, M.P...Knewley Hall, Prescott, Lancashire

Stansfield, Wm. R. C., M.P...Esholt Hall, Leeds, Yorkshire

Stopford, William Bruce...Drayton House, near Thrapston, Northamptonshire

†Stradbroke, Earl of...Henham Park, Wangford, Suffolk

†Strutt, Edward, M.P...St. Helen's, near Derby

†Sutherland, Duke of...Trentnam Park, Newcastle-under-Lyne, Staffordshire

†Sutton, Sir R., Bart...Cottesmore House, Oakham, Rutlandshire

Sutton, John Manners...Kelham, Newark, Notts.

†Talbot, Earl...Ingestre Hall, near Stafford

Thomas, Inigo...Ratton Park, Eastbourne, Sussex

†Thorold, Sir John Charles, Bart...Syston Park, Grantham, Lincolnshire

†Torrington, Lord Visct...Yokes Court, Mereworth, Kent

†Townley, R. Greaves, M.P...Fulborne House, near Cambridge

Tremayne, J. H...Heligan, St. Austell, Cornwall

Tunno, E. Rose...Warnford Park, Bishop's Waltham

†Turner, Charles H...Rook's Nest, Godstone, Surrey

Vansittart, H...Kirkleatham, Guisborough, Yorks.

Villebois, Fred...Benham Place, Newbury, Berks.

†Wakeman, Sir O. P., Bt...Perdiswell Park, Wore.

Walsh, Sir John, Bart., M.P...Warfield Park, Bracknell, Berkshire

Walsingham, Lord...Merton Hall, Thetford, Norf.

Watson, Hon. R...Rockingham Castle, Northamp.

Welby, Sir W. Earle, Bt., Denton House, Grantham, Lincolnshire

†Wellington, Duke of...Strathfieldsaye, Hartford Bridge, Hampshire

†Wenlock, Lord...Eccrick Hall, Selby, Yorkshire

West, E. R...Arnwood House, Lymington; Rathin Castle, Denbighshire

†Whitbread, W. H...South-hill House, near Bedford

Wilbraham, G., M.P...Delamere House, Northwich, Cheshire

†Williams, Sir Erasmus, Bart...Marlborough, Wilts.

Wilmot, E. Woollett...Workop Manor, Nottingsh.

†Wilson, Henry...Stowlangtoft Hall, Ixworth, Suff.

Wilshere, William, M.P...Hitchin, Hertfordshire

Wingate, W. B...Hareby House, Bolingbroke, Line.

Wood, Col. Thos., M.P...Littleton House, Chertsey, Surrey

†Worsley, Lord, M.P...Manby Hall, Granford Bridge, Lincolnshire

Wroughton, B...Woolley Park, Wantage, Berkshire

Wyndham, Col. George...Petworth House, Sussex

Wynn, Sir W. W., Bart...Wynnasy, Rhynab, Denbighshire

†Yarborough, Earl of...Brooklesby Hall, Granford Bridge, Lincolnshire

†Yorke, Henry Redhead, M.P...Syston Park, Grantham, Lincolnshire

Youatt, William...1, Osnaburgh Place, New Road

Zetland, Earl of...Aske Hall, Richmond, Yorkshire

LIST OF MEMBERS.

† Life Member's Mark.

- Abbey, Ed. York...Long Buckley, near Daventry,
Northamptonshire
†Abbey, G...Silsworth Lodge, Daventry, Northamp.
Abbey, John...The Grange, Wellingborough
Abbott, A. S...Cambridge
Abbott, Charles T...36, Gower Street
Abbot, C. H...Bower, Long Ashton, Bristol, Somers.
Abbott, Henry...Long Ashton, Bristol, Somerset.
Abbott, Stephen...Dunton, Fakenham, Norfolk
†Abbott, Step., Junr...Castleacre, Swaffham, Norf.
Abbott, Thomas...Aylesford, near Maidstone, Kent
Ablett, J...Llanbedr Hall, Ruthin, Denbigh., N. W.
Abraham, William...Barnetby, Brigg, Lincolnshire
†Ackers, J., M.P...The Heath, near Ludlow, Shrop.
Ackland, R. I...Boulston, Haverfordwest, Pembk.
Acland, Thos. Dyke, M.P...Bolniscote, Minehead,
Somersetshire
†Adair, Alexander...Heatherton Park, Wellington,
Somersetshire
Adair, Sir R. S., Bart....20 (a), St. James's Square
Adams, Edward...Bassford Hall, Newcastle, Staffs.
Adams, Capt. George...Ross, Herefordshire
Adams, G. T...Hawkhurst, Staplehurst, Kent
Adams, Henry...High Street, Windsor, Berkshire
Adams, James...Woodson House, Sundridge, near
Worcester, Worcestershire
Adams, Jas., jun...Park Cottage, Southwell, Notts.
Adams, Joseph...Newark, Nottinghamshire
Adams, Samuel...Ware, Hertfordshire
Adams, Thomas...Liverpool, Lancashire
Adams, Rev. Thos. B...Aldridge Lodge, Walsall,
Staffordshire
Adams, William Henry...Boston, Lincolnshire
Adcock, E...Farmdish, Wellingborough, Northamp.
Adcock, Stephen...Cambridge
Adcock, W...Farmdish, Wellingborough, Northamp.
Addams, Charles...Moor House, Holford, Bridge-
water, Somersetshire
†Adderley, C. B...Hams Hall, Colehill, Warwick.
Addington, Haviland John...Langford Court, Bur-
rington, Bristol
Adey, William...Chorley, Lichfield, Staffordshire
Adkins, J...Milcot, Stratford-on-Avon, Warwick.
Adney, Geo...Harley, Much-Wenlock, Shropshire
Agar, Hon. G. C...Woodstock, Oxon.
Agnew, T...Exchange Street, Manchester, Lanca.
Aglionby, H. A., M.P...Nunnery, Cumberland
Ainslie, William...Wood Hill, Ripley, Surrey
Aitchison, E., R.N...Groombridge, East Grinstead,
Sussex
Aitchison, Capt. R...Mapperton, Beaminstor, Lidi
port, Somersetshire
Aitken, Andrew...Deeping Fen, Spalding, Linc.
Albright, Nicholas...Charlbury, near Enstone, Chip
ping Norton, Oxon.
Alderman, Charles...Kintbury, Hungerford, Berks.
Aldridge, James...Throop Farm, near Christchurch,
Hants.
Aldridge, Joshua...Chippenhams Court, Burnham,
Maidenhead, Berks.
Aldridge, Robert...St. Leonard's Forest, Horsham,
Sussex
†Aldworth, W., jun...Frlford, Abingdon, Berks.
Alexander, C...Sudbury, Suffolk
Alexander, James...Doncaster, Yorkshire
Alexander, James...Somerhill, Tunbridge, Kent
Alexander, L...Foyle Park, Londonderry, Ireland
Alexander, Robert...Somerhill, Tunbridge, Kent
Alexander, William Maxwell...Southbarr, Paisley,
Renfrewshire, N. B.
Algar, Robt...West Rudham, Fakenham, Norfolk
†Allington, G. M...Swinhope House, Louth, Linc.
Allington, H. W...Welton-on-the-Hill, Louth,
Lincolnshire
Allen, Chas. W...The Moor, Kington, Herefordsh.
Allen, Henry, jun...Oakfield, Hay, Herefordshire
Allen, J...Holt Farm, Filton, near Shepton Mallett
Allen, Robt. Alfred...Billington, Sudbury, Suffolk
Allen, T., jun...Upton Cottage, Macclesfield, Ches.
Allen, William...The Lodge, Malton, Yorkshire
†Alfrey, Robert...Coombe Lodge, Reading, Berks.
Alibone, John...Hillmorton, Rugby, Warwickshire
Allies, George...Hill House, Worcester
Allin, Richard...Little Moore, Oxford
Allin, Richard, jun...Sanford, near Oxford
Allin, Wm...Great Hendred, Wantage, Berkshire
Allington, Rev. J...Little Barford, St. Neot's,
Huntingdonshire
Allison, Joseph...Bilby, Retford, Nottinghamshire
Alliston, John...38, Russell Square
Allix, Chas...Willoughby Hall, Grantham, Linc.
Allpress, R. W...Burleigh Hill, St. Ives, Huntingd.
Allsop, John...Basingthorpe, Corby, Linc.
Allsop, John...Wellow Farm, Romsey, Hampshire
Allsop, Henry...Burton on Trent, Staffordshire
Almack, John, jun...Leckonfield Park, Beverley,
Yorkshire
Almack, Barugh...Alexander Square, Brompton
Almack, Thos...Bishop Burton, Beverley, Yorksh.
Almond, Richard...Orrell, near Wigan, Lancashire

- Alsop, John...Darley Dale, Bakewell, Derbyshire
 Alsop, T., jun....Lea Bridge, near Matlock, Derbyshire
 Alston, Wm. Chas....Elmdon Hall, near Birmingham, Warwickshire
 Ambrose, John...Cotford, Colchester, Essex
 Ambrose, W. Cole...Quy, Cambridgeshire
 Ames, John...33, Green Street, Grosvenor Square
 Ames, George Henry...Cote House, near Bristol
 Ames, Levi...The Hyde, St. Albans, Herts.
 Amys, John H....Ricking Hall, Bury St. Edmunds, Suffolk
 Anderson, James...Gordale, N. B.
 Anderson, Joseph...Whitley, Tynemouth, Northid.
 Anderson, Robert...Chreicester, Gloucestershire
 Anderson, Thos....Little Harle Town, Newcastle-upon-Tyne, Northumberland
 Anderson, William, jun....Newcastle-upon-Tyne
 Andrewes, Charles Jas....Kates Grove Iron Works, Reading, Berkshire
 Andrews, Edwin...Shroton, Blandford, Dorsetshire
 Andrews, Joseph...Mildenhall, Suffolk
 Andrews, Michael...Ardoyne, near Belfast, Ireland
 Andrews, Onalow...Bradbourne, Ashford, Kent
 Andrews, Richard...Above Bar, Southampton
 Andrews, Thos....Boarded Barn, Hempsted, Saffron Walden, Essex
 Andrus, J....Scotbury, near Gravesend
 Angell, William...Hasslingfield, Cambridge
 Ankers, William...Little Mill, Kerry-Newtown, Montgomeryshire
 Annesley, Rev. Charles A. F....Eydou Hall, near Banbury, Oxon.
 Ansell, John...Gláslyn, near Abergavenny, Monmouthshire
 Ansell, Charles...Northumberland House, Tottenham, Middlesex
 Ansley, G....Houghton Hall, St. Ives, Huntingdon.
 Anslow, William...Eyton, Wellington, Salop
 Anstie, J....Mardeley Wood House, Broseley, Salop
 Anstruther, J. H. L....Hintlesham Hall, Ipswich
 †Anstruther, Sir R. A....Balaskie, Leven, Fifesh.
 Anthony, Edward H....The Moat, Much Hadham, Ware, Hertfordshire
 Antrobus, Joseph...Barnton, Northwich, Cheshire
 Applin, Henry...Misterton, Crewkerne, Somerset
 Apperley, W. H....Hereford
 Appleby, Wm....Eastfield, Ailwick, Northumid.
 †Applewhite, Edw....Pickenham Hall, Swaffham, Norfolk
 Arbuthnot, Right Hon. Charles...Woodford Lodge, Kettering, Northamptonshire
 Arbuthnot, John A....Cowarth, Chertsey, Surrey
 Arch, J....Clifton, near Sheffield, Biggleswade, Bedfordshire
 Archbold, James...Newcastle-upon-Tyne
 †Archbold, Robert, M.P....David's Town, Castle Dermot, Ireland
 Archdall, Capt....Castle Archdall, Ireland
 Archer, B. L....Woodlands, Emsworth, Hampshire
 Archer, Edward...Trelaske, Launceston, Cornwall
 Archer, John...Castle Eaton, Fairford, Gloucestershire
 Archer, Thomas...Ely, Cambridgeshire
 Archér, Wm....Horningsham Farm, Warminster, Wiltshire
 †Arden, the Hon. R. P....Pepper Hall, Catterick
 Arkcole, Wm....Langney, Westham, Eastbourne, Sussex
 †Arkell, Thomas...Pen Hill Farm, Cold Harbour, Swindon, Wiltshire
 Arkwright, E....Rock House, Matlock, Derbyshire
 Arkwright, J. T....Rock House, Matlock, Derbyshire
 Arkwright, Rev. J....Mark Hall, Harlow, Essex
 Arkwright, Peter...Willersby, Matlock, Derbyshire
 Arlett, Rev. H....Pembroke College, Cambridge
 Armitage, Arthur...Moraston, nr. Ross, Herefordshire
 Armytage, Col....Broomhill Bank, near Tonbridge Wells
 Arnatt, George...Tingewick, near Buckingham
 Arnett, Henry...Ifeld, Crawley, Sussex
 Arnold, Thomas...Tamworth, Staffordshire
 Arundell, The Hon. Robert A....Houghton Lodge, Stockbridge, Hants
 Ash, Joseph...Chapel Ash, Wolverhampton, Staffs.
 Ashbury, Joseph...Holme Lacey, near Hereford
 Ashcroft, Michael...Bank Hall, near Liverpool, Lancashire
 Ashdown, George....Mount Cottage, near Wolverhampton, Staffordshire
 Ashdown, John M....Uppington, Shrewsbury, Salop
 Ashdown, Samuel H....The Fern, Shiffall, Salop
 Ashhurst, John Henry...Waterstock, Oxford
 Ashhurst, William Henry...Waterstock House, Wheatley, near Oxford
 Ashley, Charles Gordon...Butcombe Court, near Wrington, Bristol, Somersetshire
 Ashlin, George...50, Mark Lane, London
 Ashlin, John...Frisby, Spilsby, Lincolnshire
 Ashling, William...Whittlesey, near Peterborough, Northamptonshire
 Ashmore, Joseph...Norton, near Evesham, Woreah.
 Ashton, Adam...Oakleigh, Liverpool, Lancashire
 †Ashton, Hen...Woolton, near Liverpool, Lancashire
 Ashton, Richard...Limefield, Bury, Lancashire
 Ashwin, Thomas...Stratford-on-Avon, Warwickshire
 Ashwood, Edward...The Brakes, Leintwardine, Ludlow, Shropshire
 Aslin, Thos....Redbourne, St. Albans, Hertfordshire
 Aspinall, James...Liverpool, Lancashire
 Ashteton, Wm....Downham Hall, Clitheroe, Lanc.
 †Astbury, William...4, Munster Terrace, Fulham
 Astey, Thomas...Baumber, Horncastle, Lincolnshire
 Astley, F....Melton Constable, Dereham, Norfolk
 †Aston, Samuel...Lynch Court, near Leominster
 Atcherley, Thomas C....The Hurst, Westbury, Salop
 Atherley, George, jun. (Banker)...Southampton
 †Athorpe, J. G....Dinnington Hall, Worksop, Notts
 Atkins, E. M....Kington-Lisle, Wantage, Berks.
 Atkins, George...Barton Farm, Bishopstoke, near Winchester, Hants
 Atkins, John...Winkfield, Bracknell, Berkshire
 Atkinson, Christoph...Cleeveley, Garstang, Lancaster
 †Atkinson, George...Moreland Hall, Westmoreland, near Penrith
 †Atkinson, James...Winderwath, Penrith, Cumberland

- †Atkinson, James Henry Hollis...Angerton, Morpeth, Northumberland
Atkinson, John....Chronicle Office, Chesterfield, Derbyshire
Atkinson, John...Charlton, near Salisbury, Wilts
Atkinson, Joseph...Patterick Brompton, Bedale, Yorkshire
Atkinson, Joseph...Embleton, near Alnwick
Atkinson, Matthew...Prepy, Hexham, Northumb.
Atkinson, Robt. John...Brocklesby Caistor, Lincs.
Atkinson, Thos...Kiddside, Milnthorpe, Westmoreld.
Atkinson, Tobias...Kendal, Westmoreland
†Atkinson, Wm. James...Marlow, Buckinghamsh.
Attenborough, James...Brampton Ash, Market Harborough, Leicestershire
Attenborough, Richard...Sawtry, near Huntingdon
Attenborough, Robert...Braybrooke, Market Harborough, Leicestershire
Atterbury, Henry Thomas...Woburn, Bedfordshire
Atterbury, Henry Thomas, junr...Speedwell Farm, Woburn, Bedfordshire
Atwood, William...Manor Farm, Longstock, Stockbridge, Hampshire
Atty, James...Rugby
Aungier, Mark...Clarence Terrace, Liverpool
†Austin, Col. Henry...Bellevue, Seven Oaks, Kent
Austin, Robt...Merrow House, near Guildford, Surr.
Austin, L. S...The Warren, Wootton-under-Edge, Gloucestershire
Austin, William Hazledine...Manor House, Woore, near Market Drayton
Avery, Thomas Charles...Gloucester
Aylmer, John, jun...Liss, Petersfield, Hampshire
Aylmer, John Hamilton...Walworth Castle, Darlington, Durham
Aylmer, Robert...Fincham Hill, Fincham, Downham Market, Norfolk
†Aynsley, J. Murray...Torkington, near Bristol
Ayre, Thomas...Trafalgar Park, Manchester
Ayres, Henry...Grove End House, St. John's Wood
Ayres, Robert...Girtford, Biggleswade, Bedfordshire
†Babington, Rev. Charles Cardale, M.A...St. John's College, Cambridge
Bacon, James...Pluckley, near Ashford, Kent
Bacon, Rich. Noverre...Mercury Office, Norwich
Baddock, Benjamin...Broad Street, Oxford
Baddock, Joseph...Pyrton, Tetworth, Oxfordshire
Baddeley, Thomas...Wellington, Salop
Baddeley, William...Bruton, Wellington, Salop
Baden, Andrew...Long Street, Enford, Pewsey, Wilts
Bagge, Edward...Lalington Hall, Lynn, Norfolk
Bagge, Richard...Gaywood, Lynn, Norfolk
Bagot, The Hon. Wm...Blithfield, Rugeley, Staffs.
Bagshaw, Wm. John...The Oaks, near Sheffield, Derbyshire
†Bailey, Charles...5, Stratford Place
Bailey, Edward...Martyr's Worthy, near Winchester, Hants
Bailey, Frederick...Micheldever, Andover Road, Whitechurch, Hants
Bailey, George...Lea Hall, Albrighton, near Wolverhampton
†Bailey, James...Nynehead, near Wellington, Somersetshire
Bailey, James Wm...Shenley House, Stony Stratford, Bucks
†Bailey, Joseph, M.P...Glanske Park, Crickhowell, Brecknockshire
Bailey, Joseph, jun., M.P...Easton Court, Tenbury, Worcestershire
Bailey, Rich...Eaton, Melton Mowbray, Leicestersh.
Bailey, William...Hursley, near Winchester, Hants
Baillie, Wm. Hunter...Duntisbourne, Cirencester, Gloucestershire
Baily, John Raikes...Devizes, Wiltshire
Bainbridge, C. H...Lumley Park, Chester-le-Street, Durham
Baines, John...Goosnargh, Preston, Lancashire
Baines, John Fuller...Stisted, near Braintree, Essex
Baird, Sir David, Bt...Newbyth, East Lothian; St. Margaret's Cottage, Twickenham
Baker, Arthur Octavius...Stourhead, Mere, Wiltshire
Baker, Benj. Heath...Acle, near Norwich, Norfolk
Baker, John...Woking Park Farm, Woking, Surrey
Baker, John...Castle Street, Bridgnorth, Salop
Baker, Rev. R. H...Linchmere, Liphook, Hampshire
Baker, Robert...Writtle, Chelmsford, Essex
Daker, R...Royston, Hertfordshire
Baker, Robert...West Hay, near Bristol
†Baker, Sir Edward Baker, Bart...Rauston House, Blandford, Dorsetshire
Baker, Samuel...Hawkehill Hall, Rochford, Essex
Baker, T. Barwick L...Hardwick Court, Gloucester
Baker, T. Junr...Chilton, near Rushyford, Durham
Baker, T...Rock House, Newtown, Montgomerysh.
Baker, T...Little Rollright, Chipping Norton, Oxon
Baker, Thomas Baker...Hastings, Sussex
Baker, Major T. R...Wisley Court, Plymouth, Devonshire
Baker, William...16, High Street, Bristol, Somerset
Baker, William Robert...Bayfordbury, Hertford
Baldock, E. H...5, Hyde Park Pl., Cumberland Gate
Baldwin, T...Barnet Green, near Bromsgrove, Worc.
Baldwin, W. W. T...Stede Hill, Maidstone, Kent
Balguy, John...Duffield, near Derby
Ball, Edward...Burnell, Newmarket, Cambridgesh.
Ball, John...Broomsthorpe, Fakenham, Norfolk
Ballard, James...Cowbridge, Glamorganshire
Balman, W...Radley Barton, South Molton, Devon.
Balmer, Thomas...Fochabers, N. B.
Banks, Thomas...Westfield House, West Derby, Liverpool, Lancashire
Bannerman, Alex...South Cottage, Chewley, Lanc.
Banning, T...Shepton, near Marlborough, Wiltsh.
Bannister, J. S...Weston, near Pembridge, Hereford, Leominster, Hereford
Barber, John...Derby
Barber, Rev. William...Duffield, Derby
Barclay, Donald...Mayfield, Uckfield, Sussex
Barclay, J. P...Wickham Market, Woodbridge, Suff.
Baring, Hon. Fran...Buckingham House, Brandon, Norfolk
Baring, Hon. and Rev. Fred...Melchit Park, Salisbury
Baring, John...Oakwood, Chichester, Sussex

- Barker, Rev. Benjamin...Shipdham Rectory, East Dereham, Norfolk
- †Barker, G. R...Fairford Park, Fairford, Gloucester.
- Barker, Henry John...Wem, near Shrewsbury
- Barker, James...The Hall, Bakewell, Derbyshire
- Barker, Rev. J...Stour Hall, Ramsey, Harwich, Essex
- Barker, J. H...East Lodge, Bakewell, Derbyshire
- Barker, Robert...Glynn, Barmouth, Merionethshire
- Barkley, C. T...Sunbury, Middlesex
- Barlow, Rev. G. Francis...Burgh, Woodbridge, Suff.
- Barnardiston, N. C...The Ryces, Sudbury, Suffolk
- Barnard, E...Coldham Hall, Wisbeach, Cambridge.
- Barnard, E. G., M.P...Gosfield Hall, Halstead, Essex
- Barnard, Ferdinand...Wantage, Berkshire
- Barnard, Fulke Toovey...Bristol
- Barnard, George Toovey...Bristol
- Barnard, John...Canfield Hall, Dunmow, Essex
- Barnard, Richard...Pusey, near Faringdon, Berks.
- †Barneby, William...Clater Park, near Bromyard
- Barnes, Francis Kentucky...Horfield, near Bristol
- Barnes, Philip...Royal Botanic Society
- †Barnett, C...Stratton Park, Biggleswade, Bedford.
- Barnett, Edwin...Tamworth House, Clifton, Bristol, Somersetshire
- Barnett, Joseph...Remenham Hill, Henley-on-Thames, Oxon
- Barnes, Amos...Swindon, Wiltshire
- Barnston, R. H...Crewe Hill, Farnham, Cheshire
- Barratt, John...Winterton, Brigg, Lincolnshire
- Barnett, G. A...Kate's Grove Iron Works, Reading, Berkshire
- Barrett, James...The Royal Hotel, Ross, Hereford.
- Barrington, Visc., M.P...Beckett House, Faringdon, Berkshire
- Barroby, Christ...Baldersby, near Ripon, Yorkshire
- Barrow, G. H...Ringwood House, Chesterfield, Derbyshire
- Barrow, Philip
- Barrow, W. Hodgson...Southwell, Nottinghamshire
- Barry, Pendock B...Rocklavenston Manor, Nottingham.
- Barry, Thomas...Chilton, near Thame, Oxon
- Barter, Rev. V. C...Sarsden, Chipping Norton, Oxf.
- Bartholomew, Thomas...Larnton, Wragby, Lincoln.
- Bartholomew, W...Gotho, Wragby, Lincolnshire
- Bartthrop, Nathaniel...Creetingham Rookery, near Woodbridge, Suffolk
- Bartlett, H. Albert...The Canons, Thetford, Norfolk
- Bartlett, Wm...Burbage, near Marlborough, Wilts.
- Bartlett, William...Wiatcombe, Blandford, Dorset.
- Barton, Henry...Rangemoor House, near Burton-on-Trent, Staffordshire
- Barton, Hamfrey C...Hastings
- Barton, James C...Hopwas, Tamworth, Staffordshire
- Barton, John...East Leigh, near Chichester, Sussex
- Barton, Nath...Corseley House, Warminster, Wilts.
- Barton, R. Watson...13, Mulberry Street, Manchester.
- Barton, Samuel W...Rochestown, Caher, Ireland
- Barton, Thomas...Thrextton, Watton, Norfolk
- Barton, William...Nelson Street, Liverpool
- Barwell, E. R...Southampton
- Barwell, Nath...East Cowes Castle, Isle of Wight, Hampshire
- Baskerville, H...Farley Castle, Beckington, Somers.
- Baskerville, Thos. B. M., M.P...Clyro Court, Hay, Herefordshire
- Bass, Abraham...Burton-on-Trent, Staffordshire
- Bass, Joel...Stagsden, near Bedford
- Bass, Michael...Burton-on-Trent, Staffordshire
- Bass, William...Sudbury, Suffolk
- Basall, Rob...Flamstead House, Redbourne, Herts.
- †Bastard, Thos. Horlock, Junr...Charlton Marshall, Blandford, Dorsetshire
- Batard, Thomas M. Bearda...Sydenham, Kent
- Bate, Edward...Kelsterton, Northoss, Flintsh, N. W.
- Bate, G...Houghton, Rougham, Swaffham, Norfolk
- Bate, Robert...The Square, Bridgewater, Somerset
- Bate, Samuel...Knutton, Newcastle-under-Lyme, Staffordshire
- Bate, William...Yaxley, Eye, Suffolk
- Bateman, Henry...Asthall, Witney, Oxford.
- Bateman, Henry...Maple Lodge, Rickmansworth, Hertfordshire
- Bateman, Thomas...Guilsborough, Northampton
- Bateman, Thomas Osborne...Stanley, near Derby
- Bateman, Thos. Hudson...Halton Park, near Lancaster.
- Bates, Rev. C. C...Castleton, Derbyshire
- Bates, George...Heddon, Newcastle-on-Tyne
- Bates, John...33, Lower Crescent, Clifton, Bristol
- Bates, Thos...Kirkleavington, near Yarm, Yorkshire
- Bates, Thomas Ellis...Fittleton, Amesbury, Wilts.
- Bates, Rev. Wm...Witley, near Shifnal, Shropsh.
- Bateson, Geo. Thomas...Orchardleigh House, Ecclestone, St. Helen's, Prescot, Lancashire
- Bath, Robert Phippen...Northover, Glastonbury, Somersetshire
- Bath, Thomas...Northover, Glastonbury, Somerset.
- Bathurst, Earl of...Cirencester, Gloucestershire
- Bathurst, Hon. Wm. L...7, Halfmoon Street
- †Batson, Thos...Kynastone House, near Ross, Herefordshire
- Batt, William...West Drayton, Uxbridge, Middlesex
- †Batten, John...Yeovil, Somersetshire
- †Battersby, A. G. Harford...Stoke Park, Redland, near Bristol
- †Battersby, John Harford...Stoke Park, Redland, near Bristol
- Baugh, W. H. G...Bersham, Wrexham
- Bawtree, John...Abborton, near Colchester, Essex
- Baxter, Robert...Doncaster, Yorkshire
- Baxter, S. S. (Solicitor)...Atherstone, Warwickshire
- Bayning, Rt. Hon. and Rev. Lord...Krome Rectory, Sole, Norwich, Norfolk
- Bayne, William...High Street, Oxford
- Bazalgette, Sidney...King's Bridge, Swallowfield, near Reading
- Bazzard, Joseph...Kingley, near Leicester, Warwickshire
- †Beach, Sir Michael Hicks, Bt...Williamstrip Park, Fairford, Gloucestershire
- Beach, John...Redmarley, near Gloucester
- †Beadel, James...Witham, Essex
- Beadon, Rev. Frederick...North Stoneham Rectory Southampton
- Beale, James...Canford, Wimborne, Dorsetshire
- †Bearcroft, Edw...Mere Hall, Droitwich, Worcestersh.
- Beard, Rev. James...Cranfield Rectory, Newport Pagnell, Bucks.

- Beard, John...Berwick Hall, Whitecolne, Halstead, Essex
- Beard, William...Tormarton Cross Hands, Cirencester, Gloucestershire
- Beardmore, John...Uplands, Fareham, Hampshire
- Beards, Thomas...Stowe, near Buckingham
- Beardsley, S...Alton Hall, near Wirksworth, Derby.
- Beardsley, William...Shipley Colliery, near Derby
- †Beart, Robert...Godmanchester, Huntingdonshire
- Beaseley, John...Brampton, near Northampton
- Beaseley, Thos. Calvert...Harston, Grantham, Linc.
- Beaseley, W...Welland Cottage, Spalding, Linc.
- Beauchamp, George Edw...The Priory, near Heading, Berks.
- Beaucherk, Lord Chas...16, King Street, St. James's
- Beauford, Henry W...Bletsoe, near Bedford
- Beaumont, E. B...Firmingley, Bawtry, Notts
- Beaumont, John Ang...Westhill, Wimbledon, Surr.
- Beaven, Jas...Gore Farm, Market Lavington, Wilts
- Beck, Charles Wm...Upton Priory, near Macclesfield, Cheshire
- Beck, Edw...Harpley, Castle Rising, Lynn, Norfolk
- Beck, John...Conyham, Castle Rising, Lynn, Norf.
- Beck, Peter...Shrewsbury
- Beck, Thos...Tyn-y-Llyn, Welch Pool, N. Wales
- Beck, William...Mileham, East Dereham, Norfolk
- Beckett, William, M.P...Kirkstall Grange, Leeds, Yorkshire
- Beckford, Wm...11, Lime Street, City
- Beckwith, The Rev. Henry...Eaton Constantine, Shrewsbury
- Beddall, Charles...Dairy Farm, Finchinfield, Braintree, Essex
- Beddall, Henry...Finchinfield, Braintree, Essex
- Beddall, John...Brent House, Finchinfield, Braintree, Essex
- Beddall, Thomas, jun...Justices, Finchinfield, Braintree, Essex
- Beddoe, Richard C...Bristol
- Beddoe, Thos...Curdale, Cleebury Mortimer, Salop
- Beddoes, Geo...Brunslow, Bishop's Castle, Shropsh.
- Bedford, John...Woodcote, near Shifnal, Salop
- Beech, James...Brandon Lodge, Coventry
- Beecham, William Paine...Hawkhurst, Kent
- Beeley, Sam...Palterton, near Chesterfield, Derbysh.
- Beeton, Thos...Goldstone, Market Drayton, Salop
- Beever, Henry...Rarnby Moor, East Retford, Notts.
- Beever, Sir T. H., Bart...Hargham Hall, Attleborough, Norfolk
- Belcher, Rev. George Paul...Butterton, Ashbourne, Derbyshire
- Belcher, Robert Shirley...Burton-on-Trent, Staffs.
- Belham, Robert...Stow Bydon, Watton, Norfolk
- †Beldam, Valentine...Royston, Hertfordshire
- Bell, Alexander...Winchester Wharf, Southwark
- Bell, Christopher Seymour...Newcastle-on-Tyne
- Bell, J...Brickworth, Romsey, Hants
- Bell, John...Hardwick, Burcote, Bridgnorth, Shrop.
- Bell, John...Break's Hall, Appleby, Westmoreland
- Bell, Samuel...Newhouse, Newport, Shropshire
- Bell, Thomas...Newcastle-on-Tyne
- Bell, William...30, Bucklersbury
- Bell, William...Park Row, Nottingham
- Bellairs, Rev. Henry...Bedworth Rectory, Coventry Warwickshire
- Bellamy, William...Fishtoft, Boston, Lincolnshire
- Belliss, Thomas...Birmingham
- Bellias, William...Burlington, Shifnal, Shropshire
- Belton, Wm. Howard...Longdon Hall, Wellington Shropshire
- Beman, Robt...Donnington, near Stow, Gloucestersh.
- Benbow, James...Sowdely Park, Market Drayton
- Bencraft, Stephen...Barnstaple, Devon
- Benn, Joseph...Lowther, Penrith, Cumberland
- Bennet, Philip...Rougham Hall, Bury St. Edmunds, Suffolk
- Bennet, Philip, jun., M.P...Rougham Hall, Bury St. Edmunds, Suffolk
- Bennett, Absalom...Mertyn Hall, Holywell, Flintsh.
- †Bennett, Barwell Ewins...Marston House, Market Harborough, Leicestershire
- Bennett, Henry...Rock Cottage, Redminster, Bristol
- Bennett, Rev. James Thomas...Chevelly Rectory, Newmarket, Cambridgeshire
- Bennett, John...Ingstone, Ross, Herefordshire
- Bennett, John...Mitcheldean, Gloucestershire
- Bennett, John...Bishopstow, Warminster, Wilts.
- †Bennett, Joseph...Hitchin, Hertfordshire
- Bennett, Joseph B. II...Turbury, Burton-on-Trent, Staffordshire
- Bennett, Luke...Dimsdale Hall, Newcastle, Staffs.
- Bennett, Samuel...Bickering's Park, Woburn, Beds.
- Bennett, Samuel...Shifnal, Shropshire
- Bennett, Thomas...Penk Farm, Woburn, Beds.
- Bennett, Thos...Chaddlesworth, Wantage, Berks.
- Bennett, Thomas Outley...Bristol, Somersetshire
- Bennett, William...Lewsey, near Luton, Beds.
- Bennett, William...Filton, Bristol
- Bennett, William...Syde, Cirencester, Gloucestersh.
- Bennett, Wm. George...Frampton, near Cirencester, Gloucestershire
- Bennion, Edw. David...Summer Hill, Oswestry
- Benson, Alan...Papcastle, near Cockermouth, Cumberland
- †Bepson, Rev. Henry D...Utterby House, Louth, Lincolnshire
- Benson, John...Tavistock, Devonshire
- Bent, Major John...Wexham Lodge, Slough, Berks.
- Bent, William...Chilton, near Shrewsbury
- Bentall, Edw. Hammond...Heybridge, near Maldon, Essex
- Bentall, William...Heybridge, near Maldon, Essex
- †Bentinck, Lord George...19, Cavendish Square
- Bentley, W. T. A...
- Benyon, Rev. E. R...Culford Hall, Bury St. Edmunds, Suffolk
- †Bere, Montague B...Exeter
- Beridge, Rev. Basil...Algarkirk, Spalding, Lincs.
- Berkeley, Hon. Geo. Chas. G. F., M.P...Berkeley House, Spring Gardens
- Bernard, Rev. W...Chatworthy, Wivelcombe, Somersetshire
- Berners, John...Holbrook, Suffolk
- †Berney, Sir Henry, Bart...Shoep, Atherstone, Warwickshire
- Berney, Rev. Thomas...Hockering, near Norwich

- Berry, J...Upwell, Downham Market, Norfolk
 Berry, John...Chagford, Exeter, Devonshire
 Berryman, William Chester...Wells, Somersetshire
 Bertram, Jas...Gatcombe, Newport, Isle of Wight
 Berwick, Right Hon. and Rev. Lord...Cleveland Row, St. James's
 Best, Edward...Wilnecote, Tamworth, Staffordshire
 Best, Rev. F...Flyford Flavell, Alcester, Worcester.
 Best, George...Compton, Guildford, Surrey
 Best, Jas...Park House, Boxley, Maidstone, Kent
 Best, Rev. T...Kirkby Rectory, Horncastle, Linc.
 Best, Hon. and Rev. Samuel...Abbots-Ann, Andover, Hampshire
 Bethell, Richard...Guildford, Surrey
 Bethune, Rev. George...Worth Rectory, Crawley, Cuckfield, Sussex
 †Bethune, J. D...Thorncroft, Leatherhead, Surrey
 Betts, John...King's Langley, Hemel Hempstead, Hertfordshire
 Betts, William...Friskney, Southampton
 Betts, William...Boston, Lincolnshire
 Bevan, George Rees...Brecon, S. W.
 Bevan, John...Aigburth, Liverpool
 Bewidge, John...Sutton Bonington, Loughborough, Leicestershire
 Beynon, John...Adpar Hill, Newcastle Emlyn, Carmarthenshire
 Bibby, Thomas...Llanfyllin, Oswestry
 Bick, Michael...Park Hill, Bromsgrove, Worcester.
 Bicknell, Charles...Beaumaris, Anglesey
 Biddle, Waring...Long Ham, Wimborne, Dorset.
 Biddulph, Robert...Ledbury, Herefordshire
 Biddulph, Robert M...Chirk Castle, Chirk, N. W.
 Bidwell, Jas...Hockham, near Larkingford, Norfolk
 Bidwell, W...Horringer, Bury St. Edmunds, Suff.
 Biel, Wm...St. Leonard's Farm, Beaulieu, near Southampton
 Bigg, John...Stanstead Abbots, near Ware, Herts.
 Biggs, Thos...15, Crawford Street, Portman Square
 Bigge, Chas. Wm...Linden, Morpeth, Northumb.
 Biggs, Arthur...Ashton Terrace, Bedminster, near Bristol
 Biggs, H...Stockton House, Heytesbury, Wilts.
 Bilbie, Thos...Nettleworth Hall, Mansfield, Notts.
 Bill, John...Trent Vale, Newcastle, Staffordshire
 Billington, Leonard...Preston, Lancashire
 Bingley, George...Clifton, Bristol
 Binsted, Hen...Wicor Farm, Fareham, Hampshire
 Birch, Sir T., Bart...The Hazels, Prescott, Lancash.
 Birch, Wynley...Wretham Park, Thetford, Norfolk
 †Birchall, T...Ribblesdale Hall, Preston, Lancash.
 Bird, John...Shouldham Abbey, Shouldham, Norf.
 †Bird, John...Yaxley, near Stilton, Huntingdonsh.
 Bird, J. A...Park Cottage, Brixton, Surrey
 Bird, Joseph...Hampton, Herefordshire
 Bird, Thomas...Westerfield, Ipswich, Suffolk
 Birks, J...Hemmingfield, near Barneley, Yorksh.
 Birket, Chas...Plungington Hall, Preston, Lancash.
 Birley, H. H...Broom House, Manchester
 Birt, Jacob...30, Sussex Gardens, Hyde Park
 Biscoe, Rev. Wm...Donnington Rectory, Ledbury, Herefordshire
 Biscoe, Thomas P. B...Holbrook, near Derby
 Bishop, Thomas...Brecon, S. W.
 Bishopp, James...Westburton, Petworth, Sussex
 Bissill, Edward...Satterton, Boston, Lincolnshire
 Blachford, Lady Isabella...
 Black, John...Marske, near Guisborough, Yorkshire
 Blackbourn, D...Temple Brewer, Sleaford, Linc.
 Blackburne, John Ireland, M.P...Hale, near Warrington, Lancashire
 Blackburrow, Thos...Banwell Court, Weston-super-Mare, Somersetshire
 Blackden, J. C...Alnwick, Northumberland
 †Blacker, Murray...Old Abbey House, Saxmundham, Suffolk
 Blacker, William...Armagh, Ireland
 Blackett, Sir Edw., Bart...Matfen, Newcastle-on-Tyne, Northumberland
 Blackett, Henry...Sockburn, Darlington, Durham
 Blackford, R...Chippingham, Malmesbury, Wilts.
 Blackman, Benj...Hurstmonceaux, Battle, Sussex
 Blackstone, J...31, Bayham Terrace, Camden Town
 Blackwell, Joseph...Matlock, Derbyshire
 Blagrove, Col. John...Calcot Park, Reading, Berks.
 Blagrove, Edward...Magdalen College, Oxford
 Blain, James...Green's Farm, St. Alban's, Herts.
 Blain, William...Liverpool
 †Blair, John...27, Pall Mall
 Blake, James...Bathingbourne, Newport, Isle of Wight, Hampshire
 Blake, N...Stanton-Harcourt, Engham, near Oxford
 Blake, S. W...Venne, near Wiveliscombe, Somerset.
 Blake, Wm. John...62, Portland Place
 Blaker, John...Fletching, Uckfield, Sussex
 Blakeway, Chas...Shelderton, Ludlow, Shropshire
 Blakeway, William...Leigh Hall, Worthen, near Shrewsbury
 Blanch, G. W...South Island Place, North Brixton
 Bland, Clement...Frith House, Stamford, Linc.
 Bland, John...Vine Street, Bristol
 Bland, Samuel...Alfreton, Derbyshire
 Bland, William...Hartlip, Sittingbourne, Kent
 Blandy, J...Kingston Bagpuze, Abingdon, Berks.
 Blane, Capt. Robert...2nd Life Guards
 Blane, Sir Seymour, Bart...The Pasture, Derby
 †Blane, Lieut.-Col...16, Lower Grosvenor Street
 †Blanshard, Richard...61, Lincoln's Inn Fields
 Blays, C. C...Thurgarton Hill, Southwell, Notts.
 Bleack, John...Warminster, Wiltshire
 Blencowe, Robert W...The Hooke, Lewes, Sussex
 Blick, Rev. Charles...St. John's College, Cambridge
 †Bliss, Rev. Philip, D.D...Oxford
 Blisset, Charles...Clifton, Bristol
 Blisset, Rev. H...Letton, Weobley, near Hereford
 Bloodworth, Thos...Kimbolton, Huntingdonshire
 Blundell, Joseph...Maidenstone Heath, Hound, Southampton
 Blunt, Edw. W...Kempshott Park, Basingstoke, Hampshire
 Blunt, Rev. W...Longstock, Stockbridge, Hampsh.
 Blunstone, Wm...Lady Wood, Rick Hallan, near Derby
 Blurton, Wm...Field Hall, Uttoxeter, Staffordsh.
 Blyth, D'Urban...Great Massingham, Rougham, Swaffham, Norfolk

- Blyth, H. E....Burnham Westgate, Norfolk
 Boards, William...Edmonton, Middlesex
 Boby, Charles...Finborough, Stowmarket, Suffolk
 Boddington, Benj....Burcher Court, near Kington,
 Herefordshire
 Boden, Henry...The Field, Derby
 Bodenham, Rev. Chas. De la Barre...Rotheron, near
 Hereford
 Bodenham, Francis Lewis...Hereford
 Bodley, John...Stockleigh, Crediton, Devonshire
 Body, Moses...Northiam, Rye, Sussex
 Body, Wm....South Brent, near Cross, Somersetsh.
 Boger, Deeble...Plympton, Devonshire
 Boggie, John...Cae Mawn, Beaumaris, Anglesey
 Boileau, Sir John Peter, Bart....Ketteringham Park,
 Wymondham, Norfolk
 Bolam, Isaac W....Fawdon, Whittingham, Alnwick,
 Northumberland
 Bolam, Jno....Kington Grange, Belford, Northamb.
 Bold, Thomas...Liverpool
 Bolden, John...Hyrning, Lancaster
 Bolden, Samuel Edward...Lancaster
 Boldero, H....Woolton House, Bedford
 Bolton, Lord...Blackwood Park, Basingstoke, Hants
 Bompus, G. W., M.D....Fishponds, Bristol, Som.
 Bond, Benjamin...Draycot, Stone, Staffordshire
 Bond, Rev. N....Holme, near Wareham, Dorsetshire
 Bonham, Rev. J....Willow Brook, Ballitore, Ireland
 Bonner, John...Bryngwallia, Oswestry, Shropshire
 Bonnor, William...Hildersley, Ross, Herefordshire
 Bonser, Wm. James...Merton, Surrey
 Booker, Josias...Allerton, near Liverpool
 Booker, Thos. Wm....Velindra House, near Cardiff,
 Glamorganshire
 Boote, Daniel...Eastaston Hall, Wem, Salop
 Booth, Sir Felix, Bart....43, Portland Place
 Booth, George...Wainfleet, Spilsby, Lincolnshire
 Booth, John...Kelston Grange, Louth, Lincolnshire
 Booth, John...Killerby, Catterick, Yorkshire
 Booth, James Godfrey...Hamburgh
 Booth, John...Cochran, Newark, Nottinghamshire
 Booth, Richard...Warlaby, Northallerton, Yorkshire
 Booth, Wm....Priorsley, near Shifnal, Shropshire
 Booth, Wm. B....Carlew, near Penryn, Cornwall
 Booth, W....Woodbury Hall, Biggleswade, Beds.
 Boothby, J. B....Twyford Abbey, Acton, Middle-
 sex
 Boreham, Chas....Field Place, Stone, Staffordshire
 †Borough, C. B....Chetwynd Park, Newport, Shrop.
 Bosanquet, Rev. R. W....Roch, near Alnwick, Nor-
 thumberland
 Bostock, Ellis...41, Hunter Street, Brunswick Square
 Bosworth, Thos. Wright...Spratton, Northampton
 †Botfield, Beriah, M.P....Norton Hall, Daventry,
 Northamptonshire
 Botfield, W....Decken Hill, Shifnal, Shropshire
 †Botham, George...Wexham Court, Slough, Bucks.
 Bott, John...Coton Hall, Duxton-on-Trent, Staff.
 Bottomley, Jos....King's Villa, Pontefract, Yorks.
 Boucher, Jas....Kinlet Hall, Bewdley, Worcester
 Boucher, Jas. G., jun....Shidfield House, Wickham,
 Hants
 Boucherett, A....Willingham House, Market Rasen
- Boughen, William...Haynford, Norwich, Norfolk
 Boughton, Sir W. E. R....Downton Hall, Ludlow,
 Salop
 Boulnois, Wm....12, Abbey Road, St. John's Wood
 Boulton, Rev. Wm....Wem, Salop
 †Bouchier, Chas....66, Wimpole Street
 †Bourn, James, jun....Mawley Town Farm, Cleo-
 bury Mortimer, Shropshire
 Bourne, Cornelius...Stalmine Hall, Poulton-in-the-
 Fylde, Preston, Lancashire
 Bourne, Henry Titus...Alford, Lincolnshire
 Bourne, John...Hard Street, Newcastle-on-Tyne
 Bourne, Wm. Kemp...Fisherwick, Lichfield
 Boustead, John...Beckbank, Penrith, Cumberland
 Bouverie, Edward...De la Fre Abbey, Northampton
 Bouverie, Hon. P. Pleydell...Brymore, Bridge-
 water, Somersetshire
 Bowditch, Hugh...Biggin Wood, Norwood, Surrey
 Bowdon, John Bruno...Southgate House, Chester-
 field, Derbyshire
 Bowen, Edw....Corton Coverdale, Ludlow, Shrops.
 Bowen, Evan...Ensdon House, Shrewsbury, Shrops.
 Bowen, Geo....Coton Hall, Pres, near Whitechurch,
 Shropshire
 Bowen, Jas...Troedyraur, Newcastle-Emlyn, S. W.
 Bower, Philip...Long Ashton, near Bristol
 Bowers, John...Westdean House, Chichester, Sussex
 Bowett, Thomas...Warsop, near Mansfield, Notts.
 Bowles, J. T....Milton Hill, Abingdon, Berks.
 Bowly, David...Cirencester, Gloucestershire
 Bowly, Edw....Siddington House, near Cirencester,
 Gloucestershire
 Bowly, William C....Cirencester, Gloucestershire
 Bowman, Chas...Greatford, Market Deeping, Linc.
 Bowman, Edward...East Stoke, Newark, Notts.
 Bowman, Frederick...Duddington, Stamford, Linc.
 Bowman, Thomas...Stoke Lodge, Bristol
 Bown, Jos....Pamphill, Wimborne Minster, Dorset.
 Bowser, Richard...Bishop Auckland, Durham
 Bowser, Wm....Tunstall, near Hartlepool, Durham
 Boyce, Charles...Whitlsey, Cambridgehire
 Boycott, Thos...Rudge Hall, Wolverhampton, Staff.
 Boycott, Wm....Donnington, Shifnal, Shropshire
 Boydell, John...Brynallyn, near Chester
 Boyle, Robert...Ayr, Scotland
 Boyes, Wm. Edw....Alkerton, Banbury, Oxfordshire
 Boys, Robert...Eastbourne, Sussex
 Bracebridge, C. H....Atherstone Hall, Atherstone
 Brackenbury, Wm. T....Shouldham-Thorpe, Down-
 ham, Norfolk
 Bradlock, Henry...Bury St. Edmunds, Suffolk
 Bradfield, Jas. B. Sanders...Stoke Ferry, Norfolk
 Bradley, Edward...Traguff, Cowbridge, Glam.
 Bradley, John...Blyth, East Retford, Notts.
 Bradley, Thomas...Richmond, Yorkshire
 Bradley, Wm. Alexander...Cardiff, Glamorganshire
 Bradshaw, F. jun....Barton-le-Blount, near Derby
 Bradshaw, Hercules...Culcary Cottage, Hillsborough,
 Ireland
 Bradshaw, Job...Nottingham
 †Bradshaw, John...Cranley, near Guildford
 Brady, Chas. R....Lyme Park, near Disley, Cheshire
 Bragington, George...Torrington, Devon

- Braithwaite, Garnet... Plumtree Hall, Milnthorpe, Westmoreland
- Braithwaite, J.... Orresthead, Kendal, Westmoreland
- Bramhall, Jno. S.... Sneed Park Farm, near Bristol
- Brand, Henry.... Glynde, Lewes
- Brand, Thomas.... The Hoe, Welwyn, Hertfordshire
- Brandram, John B.... Chapmore End, Ware, Herts.
- Branson, T.... Norton Cottage, near Shifnal, Shrops.
- Branswhite, Chas. H.... Gestingthorpe, Sudbury, Suff.
- Brary, Rowland.... Derby
- Brary, Thomas.... Victoria Street, Derby
- Brettell, Richard.... Finstall, Bromsgrove, Worst.
- †Bretts, Chas.... Exbury House, Fawley, Hants
- Brewer, Edgar.... Newport, Monmouthshire
- Brewitt, John.... Wickford, Ingatestone, Essex
- Brewitt, Thomas.... Rayleigh, Essex
- Brewster, Ed.... Stretton, Brewood, Penkridge, Staff.
- Brewster, Joseph.... Brewood, Penkridge, Staffordsh.
- Brice, Richard.... Bridge Place, Canterbury, Kent
- Brickwell, C.... Overthorpe Lodge, Banbury, Oxon
- Brickwell, John.... Leckhampstead, near Buckingh.
- Bridge, Sealy.... South Petherton, Somersetshire
- Bridge, Thomas.... Buttsbury, Ingatestone, Essex
- Bridger, James Weddell.... Belmont, Chigwell, Essex
- Bridgett, Joseph.... Colney Hatch, Middlesex
- Bridgewater, David.... Bont Side, Radnorshire
- Briggs, David.... Oxcombe, Louth, Lincolnshire
- Briggs, John Cavill.... Great Dunmow, Essex
- Briggs, Robert.... Castle Donnington, Leicestershire
- †Bright, J.... Teddesley Park Farm, Penkridge, Staff.
- Bright, John.... Skeffington Hall, Leicester
- Bright, Joseph.... Tunbridge Wells, Kent
- Bright, Paul.... Sheffield, Derbyshire
- Bright, Robert.... Leigh, Bristol
- Bright, Samuel.... West Derby, near Liverpool
- Brightmore, J.... Highlow, near Hathersage, Derby.
- Brigstocke, Rev. Augustus.... Gellidly wyl, Newcastle Emlyn, Carmarthen
- Brigstocke, W. O.... Blaenpont, near Carligan, S. W.
- Brimby, A. G.... Cambridge
- Brine, Rev. A. J.... Boldre Hill, Lyminster, Hamps.
- Brine, W.... Tolpudle, near Dorchester, Dorsetshire
- Brisco, Mungruve, M.P.... Coghrust Hall, near Hastings, Sussex
- Briscoe, Samuel S.... Fir-Tree House, Dudley, Worc.
- Brise, John Ruggles.... Spains Hall, Finchfield, Braintree, Essex
- Brittain, G. Dawes.... Ercall Park, Wellington, Salop
- Brittain, Richard.... Ashton Newport, Shropshire
- Brittlebank, William.... Winstar, Bakenell, Derby.
- Broad, Henry.... Stourport, Worcestershire
- Broadie, P. B.... Fenton Hall, Stoke-upon-Trent, Staff.
- Broadmead, Nicholas.... Langport, Somerset
- Brockman, F. H.... Beachborough, Hythe, Kent
- Brockman, Rev. W. D.... Beachborough, Hythe, Kent
- Brodrip, Edmund.... Manor House, Cosington, Bridgewater, Somersetshire
- Brodhurst, J. E.... Crow Hill, near Mansfield, Nottin.
- †Broke, Sir A. de Capell.... Oakley, Kettering, Nth.
- Brokenbrow, Wm. Perrins.... Beenham Farm, near Reading, Berkshire
- Bromfield, W. Williams.... Dunchurch, Warwickshire
- Bromley, John.... Derby
- Bromley, Robert.... Derby
- Bromley, Rev. Walter Davenport.... Wootton Hall, Ashbourne, Derbyshire
- Brook, Arthur Sawyer.... Bexhill, Hastings, Sussex
- Brook, James.... Park Farm, Brading, Newport, Isle of Wight
- Brook, Thos.... Pencraig Court, near Ross, Hereford.
- Brooke, John.... Birchington, Isle of Thanet, Kent
- †Brooke, Sir Rich., Bart.... Norton Priory, Runcorn, Frodsham, Cheshire
- Brooke, W.... Babworth Cottage, near Retford, Notts.
- †Brooke, Wm. de Capell.... The Elms, Market-Harborough, Leicestershire
- Brooker, Pittman.... Foot's Cray, Kent
- Brookes, John.... Burton, Much-Wenlock, Shropshire
- Brookes, Thomas.... Croxby, near Calster, Lincoln.
- Brookes, William.... Elmstree, Tetbury, Gloucester.
- †Brooks, Bernard.... Lyford, Abingdon, Berkshire
- Brooks, Rev. Jonathan.... Everton, near Liverpool
- Broomhall, T. T.... Beech Cliffe, Stone, Staffordshire
- Bros, Thomas.... 16, St. James's Place
- Brough, Wm.... Shaw Farm, Overton, Marlborough, Wiltshire
- Broughton, Rev. Clement.... Naldbury Rectory, Ashbourne, Derbyshire
- Broughton, Richard N.... Llanyrnich, Oswestry
- Broughton, Rob.... Rayton, Eleven-Towns, Shrewsb.
- Brown, Edward.... Harewood, Leeds
- Brouncker, Richard.... Boveridge, Cranborne, Dorset.
- †Brown, Alex.... Birley Grange, Wetherby, York.
- Brown, B. J.... Little Bentley Hall, Colchester, Essex
- Brown, Chas.... Redbourn, St. Albans, Hertfordshire
- Brown, C. E.... Chronicle Office, Cambridge
- Brown, Davis.... Warham Hall, Shouldham, Downham Market, Norfolk
- Brown, Francis.... Welbourn, Grantham, Lincolnsh.
- Brown, G.... Avebury, near Marlborough, Wiltshire
- Brown, Geo.... Kingsley Cottage, Alton, Hampshire
- †Brown, Rev. H. H.... Burton, Sleaford, Lincolnsh.
- Brown, Henry.... Ashby-de-la-Zouche, Leicestershire
- Brown, Henry Langford.... Barton Lodge, King'skerswell, Newton Abbot, Devonshire
- Brown, Isaac Baker.... Colne Engain, Halstead, Essex
- Brown, J. B.... Colne Engain, near Halstead, Essex
- Brown, John.... Lea Castle, Kidderminster, Worcest.
- Brown, John.... 7, St. James's Street, London
- Brown, John.... Crompton, East Itsey, Berkshire
- Brown, John.... Pear-tree Hill, Elm, White Lion, Wisbeach, Cambridgeshire
- Brown, John.... Fiddington, Bicester, Oxon
- Brown, John.... Lower Upham Farm, Hoghen St. George, Swindon, Wiltshire
- Brown, John.... Pleasant Street, Kirkdale, Liverpool, Lancashire
- Brown, J.... Wingerworth Hall, Chesterfield, Derby.
- Brown, John.... Seaton, Delaval Hall, North Shields, Northumberland
- Brown, J. L.... Farewell, near Lichfield, Staffordshire
- Brown, John W.... Utcott, near Swindon, Wiltshire
- Brown, Rev. L. R.... Kelsdale, Saxmundham, Suffolk
- Brown, Philip.... Great Horkeley, Colchester, Essex
- Brown, Potts.... Houghton, near Huntingdon
- Brown, Thomas.... Packington, Lichfield, Staffordsh.

- Brown, Thos. ... Bowling Green Farm, Kewell, Surrey
 Brown, Thomas ... Hartshorne, Derbyshire
 †Brown, Thomas ... The Nunnery, Horsham, Sussex
 Brown, Thomas C. ... Cirencester, Gloucestershire
 Brown, T. P. ... Tansor Lodge, Oundle, Northampton.
 Brown, William ... Tring, Hertfordshire
 Brown, William ... Horton, Devizes, Wiltshire
 †Brown, W. ... Richmond Hill, Liverpool, Lancashire
 Brown, W. ... South Mills, Blunham, St. Neots, Hunt.
 Brown, William ... New Court, Ross, Herefordshire
 Browne, Rev. J. C. ... Compton Martin, Wells, Somers.
 Browne, John ... Chisleton, Marlborough, Wiltshire
 Browne, Rev. G. S. ... Vicar of Atwick, near Hornsea, E. R. Yorkshire
 Browne, Rich. ... Duncombe Farm, Crediton, Devon.
 Browne, T. Beale ... Salperton House, Andoversford, Northleach, Gloucestershire
 Browne, Rev. T. C. ... The Priory, Sydenham, Kent
 †Browne, Wade ... Monkton Farleigh House, Bradford, Wiltshire
 Browne, W. ... Winterbourne, Stoke, Salisbury, Wilts.
 Browne, W. ... South Rainham, Rougham, Norfolk
 Browne, W. R. ... Chisleton, Marlborough, Wiltshire
 Browning, Jonathan S. ... Oxford
 Browning, Rev. Fred. ... Titchwell Rectory, Lynn, Norfolk
 Brownlow, George ... Woottondale, Barrow-on-Humber, Lincolnshire
 Bruce, C. L. C., M.P. ... Dunphail, Forres, N. B.
 Bruce, J. ... Tiddington, Stratford-on-Avon, Warwick.
 Bruges, William ... Haxon, Amesbury, Wiltshire
 Bruges, W. H. L., M.P. ... Seend, Melksham, Wilts.
 Bryant, J. ... Bishop's Lydeard, Taunton, Somerset.
 Bryant, William ... Newmarket, Cambridgeshire
 Brymer, J. ... Bargate House, Fordingbridge, Hants.
 †Bubb, Anth. ... Witcombe Court, near Gloucester
 Buchan, Henry ... Orchard House, Southampton
 Buchan, James ... Aggborough, near Kidderminster, Worcestershire
 Bucke, L., M.P. ... Moreton House, Bideford, Devon.
 Buckland, George ... Benenden, Cranbrook, Kent
 Buckley, Col. Edwd. P. ... New Hall, near Salisbury
 Buckley, Rev. Henry W. ... Hartshorne, Burton-on-Trent, Staffordshire
 Buckley, John ... Allithwaite Lodge, Cartmel, Milnthorpe, Westmoreland
 Buckley, John, Jun. ... Normanton Hill, Loughborough, Leicestershire
 Bucknal, Henry Wm. ... College Green, Bristol
 Bull, Capt. H., R.N. ... Winterbourne-Zelston, Marlborough, Wiltshire
 Badd, Dr. William ... 23, Park Street, Bristol
 †Bulkeley, Sir Rich. W., Bart. ... Baron Hill, Beaumaris, Isle of Anglesey
 Bull, Alban ... Haswell, Banbury, Oxon.
 Bull, Humphry ... Aston Clinton, Tring
 Bull, Thos. ... Stockingford, Nuneaton, Warwicksh.
 †Bailey, John ... Morsal, Looe, Cornwall
 Buller, Sir A. ... Pound, near Plymouth, Devonsh.
 Bullimore, W. ... Witham, near Grantham, Lincs.
 Bulling, John ... Great Tew, Oxon.
 †Bullock, F. ... East Challow, Wantage, Berkshire
 Bulmer, Charles ... Hereford
 Bult, Jas. S. ... Dodhill House, Kingstone, Taunton, Somersetshire
 Bulwer, Joslin ... Rayleigh, Essex
 Bulwer, Wm. L. ... Heydon Hall, Reepham, Norfolk
 Bunbury, H. M. ... Marlston House, Newbury, Berks.
 Bunn, Lockington St. Lawrence ... 42, Moorgate St.
 Burd, T. ... Whiston Priory, near Shrewsbury, Salop
 Burden, Rowland ... Castle Eden, Stockton-on-Tees, Durham
 Burder, Alfred H. ... Minnington, Shifnal, Shropsh.
 Burder, John ... Codham Hall, Braintree, Essex
 Burder, Joseph Davey ... Braintree, Essex
 Burdon, George ... Haddon House, Newcastle-on-Tyne, Northumberland
 Burgam, H. ... Bickerton Court, Ledbury, Herefordsh.
 Burges, Daniel ... Brislington, Bristol
 Burges, Daniel, Jun. ... Bristol
 Burges, Henry ... 29, St. Swithin's Lane, City
 Burges, James ... Ridlington Park, Uppingham, Rutlandshire
 Burgess, John ... Muston, near Blandford, Dorsetsh.
 Burgess, Joseph S. ... Holme Pierrepont, Notts.
 Burgess, Robt. ... Winterbourne Zelston, Blandford, Dorsetshire
 Burgess, Robert ... Cotgrave Place, Nottingham
 Burgess, Stephen ... Westbrook, Lydd, Kent
 Burgess, Wm. ... Wiggenhall, St. Mary Magdalen, near Lynn, Norfolk
 Burgoyne, Sir John M., Bart. ... Sutton Park, Biggleswade, Bedfordshire
 Burke, J. French ... Club Chambers, 15, Regent St.
 Burman, Wm. ... Stratford-on-Avon, Warwickshire
 Burn, William ... Alfreton, Derbyshire
 Burne, T. H. ... Loyrton Hall, Newport, Shropsh.
 Burnand, Wm. ... Norton, near Chichester, Sussex
 Burnell, Edward ... Hamham, near Bristol
 Burnell, Edward Pagge ... Winkburne Hall, near Southwell, Notts.
 Burness, Chas. ... Park Farm, Woburn, Bedfordsh.
 Burness, James ... 64, Cornhill
 Burnham, Geo. ... Wellingborough, Northamptonsh.
 Burnham, Wm. Booth ... Spital Farm, Lower Bebbington, Cheshire
 †Burr, Daniel Higford ...
 Burr, Edward ... Dunstable, Bedfordshire
 Burr, Rev. Hen. Scudamore ... Tidenham Vicarage, near Chepstow, Monmouthshire
 Burrard, Geo. ... Walhampton, Lymington, Hants.
 Burrell, Charles ... Thetford, Norfolk
 Burrell, James ... Thetford, Norfolk
 Burrell, Robert ... Durham
 Burrell, W. W. ... 5, Richmond Terrace, Whitehall
 Burroughes, Hen. Negus, M.P. ... Burlingham Hall, Norwich, Norfolk
 Burroughes, Rev. Jeremiah ... Lingwood Lodge, Norwich, Norfolk
 Burroughes, Rev. T. ... Rickingham, Botesdale, Suff.
 Burroughes, Wm. ... Hoveton Hall, Norwich, Norfolk
 Burroughes, Thomas ... Derby
 Burrows, T., Jun. ... Headington, near Oxford
 Bussey, John ... Milton, Christchurch, Hampshire
 Burt, Aine ... Witchampton, Wimborne, Dorsetsh.
 Burt, Edwin ... Montacute, near Yeovil, Somersetsh.

- Bart, Thomas...Iwerne, Blandford, Dorsetshire
 Bart, Wm....Witchampton, Wimborne, Dorsetsh.
 Barton, Rev. H. T....Aitcham Bridge, near Sturminster
 Burton, Robert...Longnor Hall, Shrewsbury
 Burt, James...Olenston, Blandford, Dorsetshire
 Bury, Edward...Hanslope Park, Wolverton, Stony
 Stratford, Bucks.
 Bury, John W....20, Devonshire St., Portland Place
 Bush, Clement...Weston, near Bath
 Bush, George...Grove House, Westbury-on-Trym,
 near Bristol
 Bushell, L....Bacon's End, Colehill, Warwickshire
 Bushell, W....Pontons, Ash, near Wingham, Kent
 Bush, E. Thos....Fond's Grove, Edmonton, Middlesex
 Butcher, John...Willstone, Fyning, Hertfordshire
 Butcher, Moses...Steeple Ashton, Devizes, Wiltshire
 Butcher, Richard...Longville, Wenlock, Salop
 Butcher, Robt...East Rainham, Fakenham, Norfolk
 Butcher, Wm...Standish, Stroud, Gloucestershire
 Butler, Capt. G....Bowling-green, Faringdon, Berks.
 Butler, Hon. Sir R., Bart...Chilworth, Southampton
 †Butler, Henry...Tulse Hill, Brixton, Surrey
 Butler, Capt. John...Kirby House, Inkpen, Hunger-
 ford, Berkshire
 Butler, John...Caerleon, Newport, Monmouthshire
 Butler, Major Robert...
 Butler, St. Thos., Bart...Bath Temple, Co. Carlow,
 Ireland
 Butler, Thomas...Ayrdoon, Romney Marsh, Kent
 Butler, Thomas...Pukeensboy, Ballyragget, near
 Kilkenny, Ireland
 Butler, T. Jun...Hatfield-Peveril, Chelmsford, Essex
 Butt, William...Sandiacre, near Derby
 †Butterfield, C. Cotton, the Bank, Petersfield, Hants
 †Butterfield, John Hen...Brackley, Northamptonsh.
 Buxton, Thomas...Malton, Yorkshire
 Byron, Robert...Bradford, Yorkshire
- Cadle, Joseph...Westbury-on-Severn, near Gloucester.
 Cairns, Jeremiah...Newport, Monmouthshire
 †Cairns, J. H....Kempstone, Corfe Castle, Dorset.
 Caldecott, Barnes...Ormesby House, Norwich, Norf.
 †Caldecott, Thos...Rugby Lodge, Rugby, Warwicksh.
 Caldecott, C. M....Myton House, near Warwick
 Caldwell, J. S....Linley Wood, Newcastle, Staffs.
 Caley, Digby...Ripon, Yorkshire
 Calhoun, W. F....Binderton, near Chichester, Sussex
 Callis, John...Mears Ashby, Northampton
 Calthorpe, Richd...Swinehead Abbey, Boston, Linc.
 Calvert, Edmund...Hunsdon, Ware, Hertfordshire
 Calvert, Edward...Derby
 Calvert, Col. Felix...Hunsdon House, Ware, Herts.
 †Calvert, Frederick...9, St. James's Place
 Calvert, Dr. J. W....11, Blandford Pl., Regent's Park
 Calvert, Thomas...Dove Bank, Uttoxeter, Staffs.
 Calvert, William...Hunsdon, Ware, Staffs.
 Cambridge, William...Market Lavington, Devizes,
 Wilts.
 Cambridge, Wm...South Runceton, Downham Mar-
 ket, Norfolk
 Cambridge, Margt...Wilderness Park, Seven Oaks,
 Kent
 Campbell, S. H....Tilton, Bishop's Waltham, Hants
- Campbell, Major T. Edm...
 Campion, Edwd...Meltham, Kimbolton, Hants.
 Campion, Rev. H....Albourne Rectory, Brighton,
 Sussex
 Campion, Rev. Job...Bedford
 Campion, Wm. J., Jun...Aitch Abbots, Winchester,
 Hampshire
 Cane, Robt...Macheford, Wickham Market, Suffolk
 Cane, Rev. T. C...Southwell, Nottinghamshire
 Cane, John...Bruton, Somersetshire
 Cane, James F...Castle Street, Liverpool
 Canner, W...Locko Grange, near Derby
 Canning, Wm. B...Chiseldon, near Swindon, Wilts.
 Cannon, Joseph Sims...Beckley, Oxford
 Cannon, Wm...Cookham, Maidenhead, Berks.
 Cantrell, C. S...Manor Farm, Old Wokingham, Berks.
 Cantrell, Chas. S., Jun...Shaw Farm, Windsor, Berks.
 Cantrell, G...Crongton Grange, Bakewell, Derbysh.
 Cantrell, Hy...Baylis Court, Stoke, Slough, Bucks.
 Cantrell, William...Wirksworth, Derbyshire
 Caparn, Daniel...Horncastle, Lincolnshire
 †Capel, Arthur...Bulland Lodge, Wiveliscombe, Som-
 ersetshire
 Capel, Wm...The Grove, Stroud, Gloucestershire
 Capper, Henry...The Willow, Coar's Road, Woburn,
 near Beaconsfield, Bucks
 Capron, George...Stoke, Northamptonshire
 Card, John...Norton Ferris, Maresfield, Sussex
 Carding, John...Pleasley, near Mansfield, Notts.
 Carew, John F...Crownside Court, near Tamerton,
 Somersetshire
 †Carew, W. H. Pole...Anthony House, Devonport,
 Devon
 Carey, John...Pylle House, Shepton Mallet, Somers.
 Cargay, Gilbert...Lindene, Selkirk, N. B.
 Carins, Michael...Meldon, Morpeth, Northumb.
 †Carleton, Hon. and Rev. Rd...25, Bruton Street
 †Carline, R...Lincoln
 Carlisle, The Lord Bishop of...Rose Castle, Carlisle
 Carnac, J. R...Warborne, near Lymington, Hants
 †Carnarvon, Earl of...Highclere House, Newbury,
 Berkshire
 Carnegie, Hon. J. J...Fair Oak, Somers, near Peters-
 field, Hampshire
 Carpenter, John Nelson...Bardisland, near Leam-
 ington, Herefordshire
 Carpenter, Thomas...Chipping Norton, Oxford
 Carpmel, William...Streatham Hill, Surrey
 Carr, John...Roseworth, Newcastle-on-Tyne
 Carr, Ralph...Dunstan Hill, near Newcastle-on-Tyne
 Carr, Robt. Lindo...Brooklands, Tranmere, Cheshire
 Carr, Thomas...Wheating, Norfolk
 Carr, Walter Edm...Walton Lodge, near Stafford
 Carr, Wm. Cockrane...Sladon, Newcastle-on-Tyne
 Carrier, Thomas...Langman, Ross, Herefordshire
 Carrington, Geo., Jun...The Abbey, Gt. Missenden,
 Amersham, Buckinghamshire
 Carrington, John...Croxdon, near Uttoxeter, Staffs.
 Carrol, H...Tulla House, Nenagh, Tipperary
 Carruthers, David...Grondra House, Chertsey, Midd-
 lesex
 Carson, William...Seaford, near Liverpool
 Carter, John...65, South Moken Street

- †Carter, John Bonham....Ditcham Grove, Peters-
field, Hampshire
Carter, J. R....Spalding, Lincolnshire
Carter, John Thomas....Hunstanton, Lynn, Norfolk
Carter, J. W....Little Totham Hall, Maldon, Essex
Carter, Thos....Styvechale, Coventry, Warwickshire
Carter, Thomas S....Moor Place, Much Hadham, near
Ware, Hertfordshire
Carter, T. S....Watlington Park, Tetworth, Oxon.
Carter, William....Boughton, Faversham, Kent
Cartlich, Thos....Chill Lodge, Tunstall, Newcastle,
Staffordshire
Cartwright, Geo....Cliff Cottage, Lyme Regis, Dorset.
Cartwright, Henry....Hill Hall, Eccleshall, Staffs.
Cartwright, John....Shrewsbury
Cartwright, Moses....Stanton House, Burton-on-
Trent, Staffordshire
Cartwright, Nathaniel....Haugham, Louth, Lincoln.
Cartwright, E. Newton....The Abbey, Lxworth, Suff.
Cartwright, Thomas....The Hill, Bewdley, Worcester.
Cartwright, Thos....Hill Hall, Eccleshall, Staffords.
†Cartwright, Thomas W....Ragnall Hall, Newton,
Newark, Nottinghamshire
Cartwright, Col. W....Brackley, Northamptonshire
Carver, W. C....Melbourn, Royston, Hertfordshire
Carver, Rev. W. J....Sprowston Hall, Norwich, Norf.
Carver, William....Ingarsby, near Leicester
Case, John Ashton....Thingwall Hall, Liverpool
Casson, R. Ditchley Park, near Woodstock, Oxon
Castellain, Alfred....Liverpool
Castellain, Charles....Upper Clapton, Middlesex
Castellain, Etienne....Belgian Consul, 3, Cop-
pold Street, City
Castle, Benjamin....St. Alden, Oxford
Castle, Charles....Clifton, Bristol, Somersetshire
Castle, T....Worle, Weston-super-Mare, Somersetsh.
Castlereagh, Viscount, M.P....127, Park Street
Castree, Josiah....Gloucester
Cathcart, Sir John Andrew....Adlestrop House, near
Chipping Norton, Oxon
Catherall, John....Mold, Flintshire, N. W.
Caulin, Thomas....Batley Abbey, Woodbridge, Suff.
Catt, Wm....Bishopstone, Newhaven, Lewes, Sussex
Cattle, William....Burleigh, Stamford, Lincolnshire
Caudwell, W....Drayton Farm, Abingdon, Berkshire
†Caulfield, St. George....Wentworth, Virginia Water,
Chertsey, Surrey
Cawen, Earl of....Barford House, Bridgewater
Cave, Charles....Bracknell, Berkshire
Cave, G....Blething, near Uckfield, Sussex
Cave, Sir John Cave Browne, Bart....Stretton-in-the-
Fields, Ashby-de-la-Zouch, Leicestershire
Cave, William....Mantbury, near Bristol
Cavendish, F....Codicote Lodge, Welwyn, Herts.
†Cavendish, Hon. Capt. G., R.N....Lyne Grove,
Chertsey, Surrey
Cavendish, Hon. George H., M.P....Ashford Hall,
Bakewell, Derbyshire
Cavendish, Hon. William Geo....Burlington House,
Piccadilly
†Cawdor, Earl of....74, South Audley Street
Cawley, James....Winwick, Warrington, Lancashire
Cayley, E. S., M.P....Wydale, Malton, Yorkshire
Chadwick, E....4, Stanhope St., Hyde Park Gardens
†Chafy, W....Connington House, St. Ives, Huntingd.
Chalcraft, W....Bramshot House, Liphook, Hampsh.
Chalk, Rev. W. S....Wilden Rectory, near Bedford
Challener, John....Overton, Congleton, Cheshire
Chalmers, Robert....50, Thurlow Square, Brompton
Chamberlain, Hen....Bredicot Court, near Worcester
Chamberlain, Henry....Desford, Market Bosworth,
near Leicester
†Chamberlayne, Thomas....Cranbury Park, Win-
chester, Hampshire
Chamberlin, W....Cropredy Lawn, Banbury, Oxon
Chambers, J....The Hurst, Tibshelf, Alfreton, Derby.
Chambers, Joseph....Wilne, near Derby
Chambers, William....Derby
Chambers, Wm., Jan....Llanely House, Llanelly,
Carmarthenshire
Chambers, Wm. Melish....Holtsock Priory, Bewtry
Champion, F. B....Edale, near Castleton, Derbyshire
Champion, Geo. Harding....Well Place, Penshurst,
near Tunbridge, Kent
Champion, H....Hafod, near Rhayader, Radnorshire
Champion, Rev. John....Taxal Rectory, Stockport,
Cheshire
Champion, T. A....Sarr, Thanet, near Margate, Kent
Champion, W....Bridge House, Worksop, Notting-
hamshire
Chandler, Thomas....Stockton, Warminster, Wilts.
Chaplin, A. T....Fulbourne, near Cambridge
Chaplin, F....Mulberry Green, Harlow, Essex
Chaplin, F....Tathwell, Louth, Lincolnshire
Chaplin, W. James....Bewham Park, Basinstoke
Chapman, George....3, Arundel Street, Strand
Chapman, John....Upton, Atherstone, Warwickshire
Chapman, Thos....Stoneleigh, Coventry, Warwick.
Chapman, Thomas....3, Arundel Street, Strand
Chapman, T. S....Aston Clinton, near Tring, Herts.
Charge, John....Chesterfield, Derbyshire
Charge, Thomas....Barton, Richmond, Yorkshire
Charlton, Rev. J. K....Elberton Vicarage, near
Bristol
Charlton, P....Withyford Hall, Shrewsbury, Shrops.
†Charlton, St. John Chiverton....Apley Castle, Wel-
lington, Shropshire
Charlton, T. B....Chilwell Hall, Nottinghamshire
Charlton, Thos. P....Hilden, near Tonbridge, Kent
Charnock, C....Holmefield House, Ferrybridge, York.
Charnock, John Henry....Wakefield, Yorkshire
Charrington, Nicholas....Leytonstone, Essex
Charteris, Hon. F....Armfield, Haddington, N. B.
Chasemore, P....Horsham, Sussex
Chatterton, John, Jun....Derby
Chatterton, Richard....Allington, Louth, Lincolnsh.
Chattock, J....Castle Bromwich, near Birmingham
Chattock, Thomas....Sollihull, Warwickshire
Chawner, Henry....Hound Hill, Uttoxeter, Staffs.
Chawner, Rich....Sudbury, Uttoxeter, Staffordshire
†Chawner, Richard Croft....Well, Lichfield, Staffs.
Cheate, Farmer....Doshill, Fazeley, Staffordshire
Cheate, Wm....Skidley, Tamworth, Staffordshire
Cheere, Rev. G....Payworth Hall, Garton, Cambrsh.
Cheere, W. H....Payworth Hall, Garton, Cambrsh.
Cheese, John....Castle Weir, Evington, Herefordshire

- Cheetam, S. . . . Hambleton, near Oakham, Rutland.
 Cheffins, H. . . . Little Easton Manor, near Dunmow, Essex
 Cheney, Colonel. . . . Gaddesley Hall, near Leicester
 Cheney, R. H. . . . Badger Hall, near Shifnal, Shrops.
 Cherry, Alfred Henry. . . . Clapham, Surrey
 Cherry, George H. . . . Denford, Hungerford, Berks.
 Chester, Thomas . . . Haven Farm, near Tickhill, Bawtry, Nottinghamshire
 Chesterfield, Earl of. . . . Bretby Park, Derbyshire
 Chetwode, Sir John Newdigate Ludford, Bart. . . . Ansley Hall, Atherstone, Warwickshire
 Chetwynde, Major Wm. Fawcner. . . . Brocton Hall, near Lichfield, Staffordshire
 Chew, S. . . . Clifton, Market Harborough, Leicestersh.
 Chichester, Lord Bishop of. . . . The Palace, Chichester, Sussex
 Chichester, Sir J. P. B., Bart. . . . Arlington House, Barnstable, Devonshire
 Child, John. . . . Merton Mills, Merton, Surrey
 Child, J. M. . . . Begelly House, near Tenby, Pembroke.
 Child, R. B. . . . Newton, Milford, Pembrokesh., S. W.
 Child, Thos. . . . Michelham Priory, Hailsham, Sussex
 Child, Wm. . . . Wigmore Grange, Ludlow, Shropshire
 Child, W. . . . Vennham Manor, Andover, Hampshire
 Chitty, Edward. . . . Guildford, Surrey
 Cholmeley, Henry Philip. . . . Brandaby, near York
 †Cholmeley, Sir M. J., Bart. . . . Easton Hall, Colstersworth, Lincolnshire
 †Cholmondeley, Lord H. . . . Holly Hill, Southampton
 Chouler, Chas. . . . Wollaston, near Nottingham
 Choyce, W. . . . Ham's Bridge, Atherstone, War.
 Christp, Thomas. . . . Hawkhill, Alnwick, Northumb.
 Christie, Langham. . . . Preston Deanery, Hackleton, Northampton
 Christmas, James. . . . West Worldham, Alton, Hants
 †Christie, W. . . . 3, Cornwallis Cres., Clifton, Bristol
 Chune, Geo. . . . Coalbrook Dale, near Shifnal, Salop
 †Churchill, Geo. . . . Buckland-Reapers, Dorchester, Dorsetshire
 Churchyard, Isaac . . . Petistree, Wickham Market, Woodbridge, Suffolk
 Cruts, W. L. Wigget, M.P. . . . The Vine, Basingstoke, Hants
 Clapham, J. . . . Layhill Common, Chesham, Bucks.
 Clarence, John. . . . 21, Cullum Street, Fenchurch Street
 Clare, W. H. . . . Twycross, Atherstone, Leicestershire
 †Clarina, Lord. . . . Elm Park, Limerick, Ireland
 Clark, Edward. . . . Devonshire Terrace, Liverpool
 Clark, Edwin. . . . Ellinthorpe Hall, Boroughbridge, Yorkshire
 Clark, Geo. . . . Hyde Hall, Sandon, Buntingford, Herts.
 Clark, George R. . . . Drogheda, Ireland
 Clark, Heaton. . . . Ellinthorpe Lodge, near Boroughbridge, Yorkshire
 Clark, John. . . . Bellesfield House, Trowbridge, Wilts.
 Clark, Rev. John Crosby. . . . Chertsey, Surrey
 Clark, John Wm. . . . Timbury Farm, Romsey, Hants
 Clark, Joseph. . . . Maidenhead, Berkshire
 Clark, James. . . . Chapel Farm, Burley, Oakham, Rutlandshire
 Clark, N., jun. . . . Urpeth, Chester-le-Street, Durham
 Clark, Thos., jun. . . . Derndale, near Horeford
 Clark, Wm. John. . . . Buckland Tautsaints, Kingsbridge, Devon
 Clark, Rev. Wm. . . . Prof. of Anatomy, Cambridge
 Clarke, Charles. . . . Matlock Baths, Derbyshire
 Clarke, Charles. . . . Nettleham, near Lincoln
 Clarke, Sir C. Mansfield, Bart., F.R.S. . . . Dunham Lodge, Swaffham, Norfolk
 Clarke, Charles. . . . Aisthorpe, near Lincoln
 Clarke, Charles Stewart. . . . Diocesan Registry Office, Bristol
 Clarke, Edward. . . . Canwick, near Lincoln
 Clarke, John. . . . New Parks, near Leicester
 Clarke, Jno. . . . Long Sutton, Wisbeach, Cambridgesh.
 Clarke, John Aldham Graham. . . . Kintnersley Castle, Hereford, Herefordshire
 Clarke, Jno. Were. . . . Bridwell, near Tiverton, Devon
 Clarke, James. . . . Gedney, Lincolnshire
 Clarke, Jos. . . . Howlet's Hall, Navestock, Ongar, Ess.
 Clarke, Joseph, jun. . . . Waddington Gate, Lincoln
 Clarke, J. B. . . . Arno's Vale, Bristol
 Clarke, Steph. . . . Eringdon Grange, Hebden Bridge, Yorkshire
 Clarke, Thos. Truesdale. . . . 34, Upper Brook Street
 Clarke, William Lewton. . . . Clifton, Bristol
 Clarke, Woodthorpe. . . . Bedhampton, near Havant, Hants
 Clavering, W. . . . University Club, Suffolk Street
 Clay, Joseph. . . . Sutton, near Shrewsbury, Salop
 †Clay, Sir William, Bart., M.P. . . . Fuiwell Lodge, Twickenham, Middlesex
 Clayden, John. . . . Littlebury, Saffron Walden, Essex
 Clayden, Wm. Carter. . . . Barham Hall, Linton, Camb.
 Claydon, Charles. . . . Cambridge
 Claypon, Joseph. . . . 9, Westbourne Street, Hyde Park Gardens
 Clayton, David S. . . . Norbury, near Stockport, Ches.
 Clayton, Hy. . . . 21, Upper Park Place, Dorset Square
 Clayton, R. C. B. . . . Adlington Hall, Wigan, Lanc.
 Cleave, Benjamin. . . . Newcombe, Crediton, Devon
 Cleeve, Henry, Bushy Lodge, Watford, Herts.
 Clement, Hampden. . . . Snareston Lodge, Atherstone, Warwickshire
 Clement, W. J. . . . Shrewsbury
 Clark, Edmund Hugh. . . . Westholme House, Shepton Mallet, Somersetshire
 Cleveland, Duke of. . . . Newton House, Bedale, Yorks.
 Clifford, Henry Clifford. . . . Frampton-on-Severn, Cirencester, Gloucestershire
 Clifford, Hy. Morgan. . . . Woodfield, Ross, Herefordsh.
 Clift, Samuel. . . . Lawleigh Hall, Litchington, Essex
 Climensson, Joseph. . . . Welney, March, Cambs.
 Clinch, J. W. . . . Witney, Oxfordshire
 Clinton, Lord. . . . Hinton House, Hatherleigh, Torington, Devonshire
 Clinton, Gen. Sir Wm. Henry, G.C.B. . . . Cocken hatch, Royston, Herts.
 †Clive, Rev. Archer. . . . Solihull Rectory, Warwicksh.
 Clode, William. . . . Bakeham House, Egham, Surrey
 Clode, John. . . . Gt. Linford, Newport Pagnell, Bucks.
 Clover, John. . . . Kirtling Place, Newmarket, Cambs.
 †Clowes, Edmund. . . . Warton, Lancashire
 Clowes, Francis. . . . 19, King William Street, City

- Clowes, Rev. John...Broughton Hall, Manchester
 Clowes, Wm. Leigh...Spondon, near Derby
 Clutterbuck, Rev. Jas. Charles...Long Wittenham,
 Abingdon, Berkshire
 Clutterbuck, Robt....Nascott House, Watford, Herts.
 Clutton, John...8, Whitehall Place
 Clutton, Robert...Hartwood, Reigate, Surrey
 Clutton, Thos. C....Chorlton Hall, Malpas, Cheshire
 Clutton, William...Edwinstone, Ollerton, Notts.
 Clutton, Wm. Jas....Edwinstone, Ollerton, Notts.
 Coape, Capel...9, York Place, Portman Square
 Coape, H. Coe...Maldon, Essex
 Coape, Wm....Wallington, near Fareham, Hants.
 Coates, Joseph...Clifton, Bristol
 Coates William...Wington, Somersetshire
 Cobb, Henry...18, Lincoln's Inn Fields
 Cobb, Robert...Town Place, Faversham, Kent
 Cobb, Timothy Rhodes...Banbury, Oxon.
 Cobbett, William...Edmonton, Middlesex
 Cobbold, John...Ipswich, Suffolk
 Cobbold, J. C. M....Ipswich, Suffolk
 Cobham, T....Marley Lodge, near Exmouth, Devon
 Cobon, James...Well Hall, Lynn, Norfolk
 Cock, William...Countledge, Appledore, near Ten-
 terden, Kent
 Cockburn, James...Havvyat Lodge, Bristol
 Cocker, Henry...Hathesage, Bakewell, Derbyshire
 Cockeram, Thomas...Up Cerne House, near Dor-
 chester, Dorset
 Cockey, Edward...Frome, Somersetshire
 Cocking, J....Tupton, near Chesterfield, Derbysh.
 Cocks, Rev. W....Wolverley, Worcestershire
 Codrington, C. Bethel...3, Park Place, St. James's
 Codrington, O. C....Dean House, Alresford, Hants.
 Coe, Robert, jun....Tilney, Lynn, Norfolk
 Coffin, Lieut.-Col. Guy...Landford, near Salisbury
 Coffin, Capt. Henry Edwd., R.N....Firtree Cottage,
 Botley, near Southampton
 Cogan, Thos. S....Eastdean, Chichester, Sussex
 Coke, Major...Woodhouse, Mansfield, Notts.
 Coker, John...Narford, Swaffham, Norfolk
 †Colborne, Lord...West Harling, Norfolk
 Colbourne, Wm....Stratford-on-Avon, Warwicksh.
 Colchester, Benjamin...Ipswich, Suffolk
 Coldham, H. W....Anmer, near Lynn, Norfolk
 Cole, C....Gorse Hall, near Kidderminster, Worcester.
 †Cole, Richard John...Chertsey, Surrey
 Cole, T. H....The Green, Wick, near Bath, Somerset.
 Coleman, J....Kearney Court Farm, near Dover
 Coleman, Richard...Langdon Abbey, Dover, Kent
 †Coles, Alfred...Snelsmore, Newbury, Berkshire
 Coles, Colonel...Wells, Somersetshire
 Coles, H. B....Middleton House, Whitechurch, Hants.
 Coles, Lieut.-Col....Woodcote, Alresford, Hants.
 Colliard, Edwin...Chisleth Park, Chisleth, Canter-
 bury, Kent
 Collard, Thomas W....Canterbury, Kent
 Collett, Russell...The Jungle, near Lincoln
 Colley, John...Osbaston, Wellington, Salop
 Collin, Rev. John, jun....Queendon Rectory, near
 Bishop Stortford, Herts.
 Collings, Daniel Hanson...Sneed Park, near Bristol
 Collins, F....Savernake Forest, near Marlborough
 †Collins, Henry...Oxford and Cambridge Club
 Collins, Rev. T. F....Betterton, Wantage, Berks.
 Collis, W. B....Iverley Lodge, Stourbridge, Worcester.
 Collison, Brown...New England, Hitchin, Herts.
 Collyer, Rev. R....Warham Rectory, Wells, Norf.
 †Colyer, William...North End, Crayford, Kent
 †Colston, Edward F....New Park, Devizes, Wilts.
 Colthurst, Jonathan...Hantworth Park Farm,
 Bridgewater, Somersetshire
 Coltman, Joseph Wm....Alborough Hall, Borough-
 bridge, Yorkshire
 Colville, Rev. A. Asgill...Livermere Rectory, Bury
 St. Edmunds
 Colville, Lieut.-Col....Duffield Hall, near Derby
 †Colvin, Beal Blacknell W....Monkhams Hall,
 Waltham Abbey, Essex
 Combermere, Viscount...Combermere Abbey, Nant-
 wick, Cheshire
 Comins, James...South Molton, Devonshire
 †Compton, Henry Combe, M.P....Minstead Manor
 House, Lyndhurst, Hants.
 †Compton, Richard...Eddington House, Hunger-
 ford, Berkshire
 Connop, N....Honeylands, Waltham Abbey, Essex
 Conolly, Col., M.P....Castletown, Donegal, Ireland
 Conroy, Sir J., Bart....Arboret Hall, Reading
 Conway, Wm. Shipley...Bodryddan, St. Asaph's,
 Flintshire, N. W.
 Conyton, Geo. E....Liss Place, Petersfield, Hants.
 Cooch, Joshua...Harleston, near Northampton
 Cook, George...University Club, Pall Mall
 Cook, Henry G....Laeton Hall, Willesborough, near
 Ashford, Kent
 Cook, Rev. J. G....Purley Hall, near Reading, Berks.
 Cook, James, jun....40, Mincing Lane, London
 †Cook, John...Hothorpe, Welford, Northamptonsh.
 Cooke, George...Digby, Sleaford, Lincolnshire
 Cooke, Rev. Jas. Y....Samer, near Hadleigh, Suff.
 Cooke, John...The Chase, Ross, Herefordshire
 Cooke, Layton...7, John Street, Adelphi
 †Cooke, P. D....Owston, near Doncaster, Yorksh.
 Cooke, Rev. Theophilus L....Beckley, near Oxford
 Cookson, I....Meldon Park, Morpeth, Northumbd.
 Cookson, John...Lytham, Preston, Lancashire
 Cookson, John...Hatherton, near Nantwich
 Cookson, Joseph...Clifton, Bristol
 Cookson, Richard...Layton Hawes, Preston, Lancs.
 Cooling, John...Lower Winchindon, Thames, Oxon.
 Cooper, Rev. B....Lewcombe Rectory, Dorsetsh.
 Cooper, F. L....Walton, Burton-on-Trent, Staffordsh.
 Cooper, George F....Langenhoe Hall, near Col-
 chester, Essex
 Cooper, H....Drakelow, Burton-on-Trent, Staffordsh.
 Cooper, I....The Bucklands, Bury St. Edmunds, Suff.
 Cooper, J. G....Blythburgh, near Wangford, Suff.
 Cooper, J....Burton, near Bury St. Edmunds, Suff.
 Cooper, J. Rous...Red House, Westleton, Suffolk
 Cooper, R....Pebworth, Chipping Camden, Gloucester.
 Cooper, Samuel...Kenley-on-Thames, Oxon.
 Cooper, Samuel J....Ardleigh, Colchester, Essex
 Cooper, Thos....Norton Seaford, near Lowest, Suff.
 Cooper, Thomas...Swineshead, Lincolnshire.

- Cooper, Thomas...Ashford, Bakewell, Derbyshire
 Cooper, William D. C....Taddington Manor, near
 Dunstable, Beds.
 Cooper, William Henry...Shrewsbury
 Coote, Mrs. Sarah...Mornington House, Richmond
 Hill, Clifton, Bristol
 Coote, William...St. Ives, Huntingdonshire
 Cope, Sir John...Bramshill, Hartford Bridge, Hants.
 Cope, William...Shifnal, Salop
 Copeland, Joseph...Abingdon, Berkshire
 Copestake, Thos. G....Kirkby Langley, near Derby
 †Coppard, Thomas...Horsham, Sussex
 Corbet, Andrew W....Sandorne Castle, Shrewsbury
 Corbett, Sir A. V., Bt....Aston Reynald, Shrewsbury
 Corbett, Vincent E....Westleton, Oswestry
 Corbett, Edward...Longnor Hall, Shrewsbury
 Corbett, G....Croft's Marsh, Wainfleet, Lincolnsh.
 Corbett, James...The Sheriff's Farm, Pembridge,
 Herefordshire
 Corbett, J. S....Cardiff, Glamorganshire
 Corbett, Rev. Joseph...Tugford, Shrewsbury
 Corbett, Vincent...Worthy, near Sheffield
 Cork, George...Riding School, Islington
 Cornack, H. D....Deansgate, Manchester, Lanca.
 Cornack, William...Covent Garden
 Cornack, William John...Covent Garden
 Cornell, Joseph...Wethersfield, Braintree, Essex
 Cornwell, Sir Velters, Bart....Moccas Court, near
 Hereford
 Corney, Thomas...65, Old Broad Street
 Cornwall, Mrs....Linton Place, Staplehurst, Kent
 Corrance, Fred....Lowdham, Woodbridge, Suffolk
 Corrie, Adam...Wellingborough, Northamptonshire
 Corringham, E. W....Bolton Hill, East Retford,
 Nottingham
 Cosens, William...Langdon, Dawlish, Devon
 Coyte, Rev. Chas. Grey...Stanton St. Quintin, Chip-
 penham, Wilts
 Cothe, William...Middle Aston, Woodstock, Oxon.
 Cottam, Geo....Winsley Street, Oxford Street
 Cottam, Henry...Merton, Retford, Nottinghamshire
 Cottisburgh, Led...Coppice Hill, Wimbleton, Surr.
 Cottrell, Jacob Henry...Bath
 Cottingham, John G....Chesterfield, Derbyshire
 Cottingham, L. O....Reydon, Southwold, Suffolk
 †Cotton, Alexander...Hildersham Hall, Cambridge
 Cotton, Rev. Alexander...Girton, Cambridge
 Cotton, B....Afton House, Yarmouth, Isle of Wight
 Cotton, Rev. Chas. E....Dalbury Rectory, Derby
 Cottle, Chas. Robert...Broughton Hall, Worthen-
 bury, near Wrexham
 Cotton, H....Amor Hall, Washbrook, Ipswich, Suff.
 Cottrell, Michael Geo...The Terrace, White Hart
 Lane, Tottenham
 Cotton, W. A....Blossoms, Salop
 Cottrell, Robt. Jno...Wadworth, Doncaster, Yorks.
 Coupland, John Geo...Bresson, Boston, Linc.
 Coupland, J....Southampton
 Coupland, Rich...Waddington Marsh, Lincoln
 †Courtney, Viscount, M.P....Powderham Castle,
 Exeter
 Courthorne, G. C....Whyley, Lamberhurst, Hants-
 gton, Sussex
 Courtney, Thos....Stratton, Andover Road, Whit-
 church, Hants
 Cousmaker, Lannoy...Westwood, Farnham, Surrey
 Coverdale, John...Oak Lodge, Kilburn, Middlesex
 Cowdell, Rev. Henry...Shelderton, near Ludlow
 Cowell, John...Holt, near Worcester
 Cowen, Joseph...Bladon Burn, Newcastle-on-Tyne
 Cowper, Earl...Great Stanhope Street
 Cox, Edw. Soreby...Brailsford, Derbyshire
 Cox, Geo. Hy. Richardson...Spondon, near Derby
 †Cox, Henry...Trevreux, Lympsfeld, Surrey
 Cox, John Henry...Parkfield, near Derby
 Cox, Samuel Walker...Breadsall, near Derby
 Cox, Thomas...Walton Hall, Barton-on-Trent
 Cox, William...Brailsford, near Derby
 Cox, Wm. Thos...Cottage, Spondon, near Derby
 Coxe, Francis L....Wye Cottage, near Chipstow
 Coxe, Philip S....Ardington Mill, Wantage, Berks.
 Coxwell, Capt. Edw....Warfield Cottage, Bracknell,
 Berkshire
 Coyney, Chas...Weston Coyney, Newcastle, Staffs.
 Cozens, D. G., jun...Bickenhall, Taunton, Somst.
 Cozens, John...Wraxhall House, Charlton Kings,
 Cheltenham
 Cozens, Robert...Milton Farm, Wells, Somersetshire
 Cozens, Robt...Norton Farm, Sutton Scotney, Win-
 chester
 Crabbe, Thos....Chenies, Rickmansworth, Herts.
 Cracroft, Col....Hackthorn, Lincoln, Lincolnshire
 Cradock, S....Hartforth Hall, Richmond, Yorkshire
 Cradock, Thos...Woodhouse, Loughborough, Leices-
 tershire
 Cragg, Wm...Threackingham, Folkingham, Linc.
 Craigh, Rev. J....Chipperton, King's Langley, Herts
 Craikanthorpe, Harrey...Eastham, near Chester
 Crane, Hy...Oakhampton, Stourport, Worcestersh.
 Crane, Jno...High Habberley, Kidderminster
 Cranston, Thomas...Upper Lyde, Hereford
 Craven, Hy...Wickham Hall, near Bromley, Kent
 Crawlhall, Isaac...White House, Stanhope, Durham
 †Crawhall, Wm...Stagslaw Close House, Hexham
 Crawler, Henry...7, Southampton Buildings, Chan-
 cery Lane
 Crawler, Thomas...Colham, Surrey
 Cree, John...Ower Moign, Dorchester, Dorset
 Creed, John...Ampney St. Mary, Ashbrook, near
 Cirencester, Gloucestershire
 Cremorne, Lord...Dartry, Rockcorry, Ireland
 Crespiigny, P. C...Woodton-under-Edge, Gloucestr.
 Creswell, Robert...Idridgehay, near Wickworth
 Creswell, A. J. B., M.P...Creswell, near Morpeth
 Cretney, Thomas...Dunsfold, Godalming
 Crewe, Sir John Harpur...Calks Abbey, near Derby
 Cripps, Frederick...Dale Street, Liverpool
 Cripps, John Martin...Novington, Lewes, Sussex
 Cripps, Raymond...Cirencester, Gloucestershire
 Cripps, Thomas...Oxford
 Crisp, Fortunatus...7, Wellington St. North, Strand
 †Crisp, Thos...Gedgrave Hall, Woodbridge, Suffolk
 Critchley, Henry...Eaton House, Penkridge, Staff.
 Critchley, Henry...Hogdock, Newton-le-Willows,
 Warrington, Lancashire
 Croft, Archdeacon, M.A...Saltwood, Hythe, Kent

- Croft, Henry...Liverpool
 Croft, Sir J., Bart....Millgate Lodge, near Maidstone
 Croft, Rev. Rd....Hartburn, Morpeth, Northumb.
 †Crofton, Lord....Mote Park, Athlone, Ireland
 Crofton, Thos....Holywell, Durham
 Croggon, T. J....2, Ingram Court, Fenchurch Street
 Crompton, Sir S., Bart....Woodend, Thirsk, Yorks.
 Croome, J....Acton Hall, Berkeley, Stroud, Gloustr.
 Croome, William...Tewkesbury, Gloucestershire
 Croose, George...The Burcotts, Hereford
 Croote, William...Lapford, Chumleigh, Devonshire
 Cropley, James...Ely, Cambridgeshire
 Cropper, Wm....Minting, near Wragby, Linc.
 Crosbie, Robt....Liverpool
 Cross, Geo. Brent...Bristol
 Cross, William Asheton...Red Scar, near Preston, Lancashire
 Crose, Henry...Boyton Hall, Stowmarket, Suffolk
 Crose, James...Gringley, Retford, Notts.
 Crosskill, William...Beverley, Yorkshire
 Croshley, J....Southcliffe, near Todmorden, Lancs.
 Crotchwaite, John...Much Wootton, near Liverpool
 Crouch, A. W....Ridgmont Park, Woburn, Beds.
 Crouch, James...Cainhoe, Silsoe, near Bedford
 Crouch, John...Cirencester
 Crowdy, Hy. Crowdy...Highworth, Wilts.
 Crowdy, James...Highworth, Wilts.
 Crowdy, Wm. Morse...Swindon, Wilts.
 †Crow, G....Ornham, Boroughbridge, Yorkshire
 Crowe, John William...Gonel House, Cambridge
 Crowther, Rev. Samuel...Knowle, Warwickshire
 Croy, John Du...Manor House, East Hanningfield, Chelmsford
 Crouton, John...Llanfardla Isaf, Oswestry, Shropsh.
 Crump, James...Melksham, near Derby
 Crump, Jos....Wooler's Hill, Pershore, Worcester-shire
 Crundall, Edward...Cirencester, Gloucestershire
 Crundwell, George...Castle Hill, Tunbridge, Kent
 Cruse, Francis...Leak, Staffordshire
 Cruse, John, jun...Leak, Staffordshire
 Crutchley, Percy H...Sunning Hill Park, Chertsey, Surrey
 Cubley, Samuel...Quarrington, Sleaford, Lincolnsh.
 Cuff, W. F...Merriott, near Ilminster, Somerset.
 Cull, Thomas...East Farleigh, Maidstone, Kent
 Culliford, Wm...Cheyton Mendip, Bath, Somerset.
 Cullum, John...Ipswich, Suffolk
 Cullum, S...Townsend Farm, St. Albans, Herts.
 Cullumwell, J....Claveshay Farm, North Petherton, Somersetshire
 Culverwell, F....Dunleigh, Bridgewater, Somerset.
 Cunniff, R....Babinstock Hall, Oswestry, Flintshire
 Cunliffe, Sir Robert, Bart...Acton Park, Wrexham, Denbighshire
 Cunningham, John...Hensol, Castle Douglas, Kirk-cubright
 Cunningham, Geo...Oak Vale, near Liverpool
 †Cure, Capel...Blake Hall, Ongar, Essex
 Cureton, George...Westbury, Salop.
 Cureton, John...Bardsley, Hillesmea, Salop.
 Curry, Benj...6, Old Palace Yard, Westminster
 Currie, Edmund...Oakley House, Abingdon, Berks.
 Currie, H....West Horsley Park, Leatherhead, Surrey
 Currie, James...Hillside, King's Langley, Herts
 Currie, J. D...Dysserth, Welchpool, Montgomerysh.
 Currie, Raikes, M.P....4, Hyde Park Terrace
 Curteis, H. B...Windmill Hill, Hurst Green, Sussex
 Curtis, Edward...New Barn Farm, Gatcombe, New-port, Isle of Wight
 Curtis, Admiral Sir Lucius, Bart...Gatcombe House, Portsmouth, Hampshire
 Curtis, Samuel...Wellington Valley, New S. Wales
 Curtis, Wm...Netheravon House, Amesbury, Wilts.
 Curtler, T. G...Bever House, near Worcester
 Curtois, Rev. P...Longhills, near Lincoln
 Curtois, Rev. R. G...Nile Terrace, Rochester, Kent
 Curzon, Hon. and Rev. Alfred...Weston Underwood, near Derby
 Curzon, Hon. and Rev. F...Mickleover, near Derby
 Custance, H. T...Weston House, Norwich, Norfolk
 Cathbert, James...12, Clayton Square, Liverpool
 Cutts, John...The Hill, Chesterfield, Derbyshire
 Dadda, James...Wingham, Canterbury, Kent
 Dadda, John, sen...Wingham, Canterbury, Kent
 Dadda, John, jun...St. Nicholas, Thanet, Kent
 Daintree, R...Hemingford Abbots, St. Ives, Hunts.
 Daintry, T. R...North Rode, Maclesfield, Cheshire
 Dalgairns, William...Guernsey
 Dallow, W. A...Mawley, Cleobury-Mortimer, Shrop.
 Dalton, J...Fillingham Manor, Spittal, Lincolnsh.
 Dalton, James...Bures, near Colchester, Essex
 Damen, Angel...Lale Brewers, Langport, Somerset.
 Damen, John Angel...New Farm, Winforth, Dorchester, Dorset.
 Damer, The Hon. Dawson...Tilney Street, Maghair
 Dampier, H. L...Colinshays, near Burton, Somerset.
 Dandridge, Danl...East Hamstead, Abingdon, Berks.
 Dames, John...Halford, near Ludlow, Salop.
 Danger, Thomas...Clifton, Bristol
 Danger, Wm...Tedworth, near Andover, Hampshire
 Daniel, Edward, jun...Clifton, Bristol
 †Daniel, John...Parson's Green, Fulham, Middlesex
 Daniel, Thos., jun...Stoodley, Tiverton, Devonshire
 Daniel, William...Burton-on-Trent, Staffordshire
 Daniell, Frank...Camborne, Cornwall
 Daniell, Ralph A...Fairfield, Lymington, Hants
 Danson, William...27, Gt. George Street, Liverpool
 Dare, Rev. W. H...Crover, Mount Nugent, Ireland
 Darke, Thomas...Launceston, Cornwall
 Darling, Geo...Helson House, Wooler, Northumb.
 Darling, Thos...Beau-Dessert Farm, Lichfield, Staffs.
 Darnell, Thos...St. Neots, Huntingdonshire
 Derton, Thos. H...King's Walden, Hitchin, Herts.
 Darwin, Sir F. S...Sydhope, near Matlock, Derbysh.
 Dashwood, Francis...8, Seymour Pl., Carnon Street
 Dashwood, Henry...Kartington, Woodstock
 Deabury, Rev. Edw. A...Ampney, near Cirencester
 Danbuz, J. B...Offington House, Worthing, Sussex
 Davy, George...Dorchester, near Wallingford
 Davey, Richard...Redrath, Cornwall
 Davenport, Edward...Spurrow Hall, Banbury, Tarp-orley, Cheshire
 Davenport, George...Oxford
 David, Evan...Fairwater, Cardiff, Glamorganshire

- Davidson, Geo...Pennington's Priestgate, Darlington
Davidson, Jas...Ashby-de-la-Zouch, Leicestershire
Davidson, Wm...Scotter, Gainsborough, Lincolnsh.
Davies, D. S., M.P....Pentre, Newcastle Emllyn, Carmarthenshire
Davies, Evan...Patten, Mach Wenlock, Shropshire
Davies, George...Pibor Wen, near Carmarthen
Davies, H...Blakebrook, Kidderminster, Worcesters.
Davies, James...The Green, Aberystwith
Davies, John...Fronhlog, near Corwen, Shrewsb.
Davies, John...Stewpony, Stourbridge, Worcestersh.
Davies, Robert...Wells, Somersetshire
Davies, Rev. R. W. P....Court-y-Gollen, Crickhowell, Brecknockshire
Davies, Rev. S...The Grange, Oystermouth, Swansea
Davies, T...Llangattock, Crickhowell, Brecknocksh.
Davies, William...Netherton Farm, Harewood, near Ross, Herefordshire
Davis, Cornelius Butler...East Woodhay, Newbury
Davis, Hy...Old Downs, Oakhill, nr. Bath, Somerset.
Davis, Major H. T...Waterhouse, near Bath, Somerset.
Davis, Hewett...Spring Park, Croydon, Surrey
Davis, Jonathan...Webton Court, Herefordshire
Davis, John...Banbury, Oxfordshire
Davis, John...Maperton, Wincanton, Somersetshire
Davis, Peter...Milton House, Pembridge, Leominster
†Davis, Richd...Skaynes, Edinbridge, Sevenoaks
Davis, Robert...Sungrove Lodge, East Woodhay, Newbury, Berkshire
†Davis, Samuel...Swerford Park, Banbury, Oxon
Davis, Samuel...Frampton, Dorechester, Dorsetshire
Davis, Thomas...64, Lower Brook Street
Davis, Thos...Little Wenlock, Wellington, Salop
†Davis, Thomas Henry...Orleton, near Worcester
Davis, W. H...Church Street, Chelsea
Davison, Jas...Tritlington, Morpeth, Northumberland.
Davison, John...Brandon, White House, Alnwick
Davison, Thomas...Durham
Davy, Francis...Topham, near Exeter, Devonshire
Davy, G. Gibson...Aiskew Hall, Bedale, Yorkshire
Davy, H...Wansop, near Mansfield, Nottinghamshire
Davy, J...Churchill, Broad Clist, near Exeter, Devon.
Davy, J...Flitton-Barton, South Molton, Devonshire
Davy, Robert...Ringwood, Hampshire
Davy, Walter...Thornway Vale, Oakton, Lincolnsh.
Dawes, Rev. Harry J...West Court, Gillingham, Chatham, Kent
Dawkins, Henry...Sandgate, Kent
Dawson, Edward...Aldcliffe Hall, Lancaster
†Dawson, Edward...Long Whaddon House, near Loughborough, Leicestershire
†Dawson, H...Launde Abbey, Uppingham, Rutlan.
Dawson, J...Gronant, Holywell, Flintshire, N. W.
Dawson, W...Birtherpe, Folkingham, Lincolnshire
Dawson, William...High Street, Bedford
Dawson, W. K...Panman's Farm, Alresford, near Colchester, Essex
Day, A...Harford House, Dighton Street, Bristol
Day, J...Burgill, Chiddingley, near Lewes, Sussex
Day, Theodore...Porthamal, Brecon
Day, Thomas...Woraditch, Kimbolton, Huntingd.
Day, William...St. Neots, Huntingdonshire
Dayman, John...Nambury, Bideford, Devonshire
Dean, Alex...Pershore Road, Smithfield, Birmingham.
†Dean, A. K...East Brent, Axbridge, Somersetshire
†Dean, F. Keball...East Brent, Axbridge, Somerset.
Dean, Henry...Weston, Petersfield, Hampshire
Dean, James...The Yews, Tottenham, Middlesex
Dean, John...Peterborough, Northamptonshire
Deane, Edward Guy...Mount Pleasant, Liverpool
Deane, Ralph...Escourt House, Watford, Herts.
Deans, Rev. J...Vicar of Melbourne and Chellaston, Derbyshire
Dearden, Jas...Rochdale, Manchester, Lancashire
Death, George...Long Melford, Sudbury, Suffolk
De Berg, M...30, Dover Street, Piccadilly
Deck, Isaiah...Cambridge
Deedes, William...Sandleing Park, Hythe, Kent
Deere, John R...Montague House, Lanchbridge, near Bath, Somersetshire
Delano, William...Tottenham, Middlesex
De l'Isle and Dudley, The Earl of...Penshurst, Kent
Dell, Thos...Broadway Farm, Great Berkhamstead, Hertfordshire
†De Mauley, Lord...Canford House, Wimborne, Dorsetshire
Dempster, William...13, Strand Street, Liverpool
Denham, William...Siddall's Lane, Derby
†Denbigh, Earl of...Newnham Paddock, Lutterworth, Leicestershire
Denman, Arnold...Wellington, Eastbourne, Sussex
Denne, David...Lydd, Kent
†Dennett, Mullens...Lodsworth, Petworth, Sussex
Dennis, Robert...Greetham, Horncastle, Lincolnsh.
Denston, Stephen W...Grafton Lodge, Shrewsbury
Denston, S...Stanwardine Hall, Ellesmere, Salop
Dent, John...Worcester
Dent, Joseph...Ribston Hall, Wetherby, Yorkshire
Dent, Villiers...Avon Cottage, Ringwood
Dent, William...Brampton, near Huntingdon
Denton, Thomas...Lew, Witney, Oxfordshire
Denton, William...Cortown Harbour, Gorey, Ireland
Derry, Charles M...Gedney, Holbeach, Lincolnshire
Dexter, Joseph...Bramcote, Tamworth, Staffordshire
Dexter, W., Jun...Leckington, Tamworth, Staffs.
Des Vaux, Henry...Drakelow Park, Derbyshire
De Vere, S...Currah Chase, Adare, Limerick, Ireland.
Devorell, John...Purbrook-Park, Portsmouth
Devon, Earl of...Powderham Castle, Exeter, Devon.
Devon, Charles...Teddington, Middlesex
Dew, J...Craddock, Ross, Herefordshire
Dew, James...Bristol
Dewey, Lewis...Woodcock Lodge, Little Berkhamstead, near Hertford
†Dewing, R...Carbrooke, Watton, Norfolk
Dewing, William Edward...Leiston Hall, Suffolk
De Winton, J. Parry...Maesderwen, Brecon, S. W.
†Dickens, Charles Scrase...Horsham, Sussex
Dickenson, J...Paxton Dean, Felton, Northumberland.
Dickin, John...Shrewsbury
Dickin, John...Waters Updon, Wellington, Shrops.
Dickin, Thos...Loppington House, Wem, Shropsh.
Dickins, Charles...Kimbolton, Huntingdonshire
Dickins, F...Adiaham Rectory, Wingham, Kent
Dickins, Robert A...Woodford Grange, Welverhampton, Staffordshire

- †Dickinson, E. H. ... King's Weston, Somerton, Somersetshire
 Dickinson, Harvey...Heverswood, Brasted, Kent
 Dickinson, H. ... Severn House, Colebrook Dale, Salop
 Dickinson, John...Abbot's Hill, Watford, Hertford.
 Dickinson, Joseph...Westbury, Salop
 Dickinson, T. ... Great Ponton, Grantham, Lincoln.
 Dickinson, William...7, Curzon Street, May Fair
 Dickon, T. ... Thoresway, near Caistor, Lincolnshire
 Dickson, Francis...Chester
 Dickson, James...Chester
 Dickson, Robert, M.D. ... 3, Curzon Street
 Dickson, Rob. ... East Wickham, near Welling, Kent
 Didsbury, Thomas...Rotherham, Yorkshire
 Digby, E. ... Minterne House, Dorchester, Dorsetshire
 Digby, Rev. K. ... Tetreshall Rectory, Litcham, Norf.
 Digby, Lieut.-Col. Robt...62, South Audley Street, Grosvenor Square
 Dighton, Francis...Northallerton, Yorkshire
 Digging, James...Shereford, Fakenham, Norfolk
 †Dilke, Capt., R.N. ... Maxstoke Castle, Coleshill, Warwickshire
 †Dilke, C. Wentworth...76, Sloane Street
 Dilke, C. W. ... 3, Lower Grosvenor Place
 Dillon, Viscount...Ditchley Hall, Emsay, Oxon
 Dimmock, John B. ... Shelton-under-Hairy, Newcastle, Staffordshire
 Dinning, John...Elford, near Belford
 Disbrowe, Sir Edward Cromwell...Envoy Extraordinary and Minister Plenipotentiary of H. B. M. at the Hague, H. M.'s Ambassador to the Netherlands and the Hague
 †Divett, E., M.P. ... Dystock, Esmouth, Devonshire
 Dix, Robert...Stamford Rivers, Romford
 Dixon, Charles...Stamstead Park, Chichester, Sussex
 Dixon, George...Oxford
 Dixon, Henry...Witham, Essex
 Dixon, Henry...Oxford
 Dixon, James...Page Hall, near Sheffield, Yorksh.
 Dixon, John...Harmston, near Lincoln
 Dixon, J. G. ... Caistor, Lincolnshire
 Dixon, Peter...Holme Eden, Carlisle
 Dixon, R. W. ... Wickham Bishops, Witham, Essex
 Dixon, Thomas...Darlington, Durham
 Dixon, Thos. J. ... Holton, near Caistor, Lincolnsh.
 Dobede, John...Soham, Cambridgeshire
 Dobito, Geo. ... Kirtling Hall, Newmarket, Cambs.
 Dobree, Harry...Beau Sejour, Guernsey
 Dod, J. W. ... Cloverley Hall, Whitchurch, Shropsh.
 Dod, Henry...The Colony, Barnham, Somersetsh.
 Dod, Henry D. ... Mansfield Woodhouse, Notts.
 Dodd, George...Chenies, Rickmansworth, Herts.
 Dodd, John...Bagley, Ellesmere
 Dodd, Thomas...Rainham, Sittingbourne, Kent
 Dodd, William J. ... Ipsden, Wallingford, Berks.
 Dodds, Ralph...Newcastle-upon-Tyne
 Dodds, Thomas...Standish, Wigan, Lancashire
 Dolby, Charles...Spalding, Lincolnshire
 Dolby, Wm. ... Marston, Grantham, Lincolnshire
 †Dollond, Geo. ... North Ter. Camberwell, Surrey
 Dolphin, John...Hunter House, Newcastle-upon-Tyne, Northumberland
 Dolphin, Thos. ... Swafield, North Walsham, Norf.
 Donaldson, John S. ... 1, Highbury Park North, College Road, Islington
 Donaldson, Thomas...Longlands, Eltham, Kent
 Doncaster, G. ... Middlethorpe, near Newark, Notts.
 Donkin, G. ... Wyfold Ct., Henley-on-Thames, Oxon
 Donkin, Samuel...Bywell, Felton, Northumberland
 Donkin, T. ... Weston Hall, Whitwell, near York
 Donovan, Richard...Ballymore, Carnolin, county Wexford, Ireland
 Dorchester, Lord...Greywell, Odiham, Hants.
 Dormer, C. Cottrell...Rousham, Woodstock, Oxon.
 †Dorfen, Charles...Lavant House, Chichester, Suss.
 Dorian, Mrs. ... Lavant House, Chichester, Sussex
 Douro, Marquis of, M.P. ... 3, Upper Belgrave Street, Belgrave Square
 Dover, Henry...Caston, Watton, Norfolk
 Dowden, T. ... Mitcheldever, near Winchester, Hants.
 Dowding, John...Upper Wick, Wick Episcopi, near Worcester
 Dowell, Rev. Thomas...Wellington Heath, Ledbury, Herefordshire
 Dowle, John...Clay Pit, Chepstow, Monmouthsh.
 Downes, Thomas...Brynech, near Brecon
 Downes, Thos. ... Patton, Much Wenlock, Shropsh.
 Downes, William...Dedham, Colchester, Essex
 Downing, John...Casthorpe, Grantham, Linc.
 Downing, John Cole...The Hill, Earl Soham, Woodbridge, Suffolk
 Downs, John Henry...Maltster, Grays, Essex
 Downward, Rev. Geo. Rich. ... Shrewsbury, Shrops.
 Doynne, Robert...Wells, county Wexford, Ireland
 Drage, Thomas...Haddenham, Ely, Cambridgesh.
 Drake, F. W. T. ... St. Paul's Walden, Welwyn, Herts
 Drake, George...Manor Farm, E. Tytherley, Stockbridge, Hants.
 Drake, John W. ... Wickham, Norwich, Norfolk
 Drake, Sir T. Trayton F. Elliot, Bart. ... Nutwell Court, near Exeter, Devonshire
 Drake, T. T. ... Shardoes, Amersham, Bucks.
 Draper, George...Melbourne, near Derby
 Draper, Thomas...Wilm Mills, near Derby
 †Drax, J. S. W. Esq., M.P. ... Charborough Park, Blandford, Dorsetshire
 Drew, J. ... Peamore Cottage, near Exeter, Devonsh.
 Drow, J. W. ... Bereley House, Petersfield, Hants
 Drew, John, jun. ... Peamore Cottage, near Exeter, Devonshire
 Drew, Rev. John...Tregunnon, Newtown, Montgomeryshire
 Drew, P. ... Glanvassen, Newtown, Montgomerysh.
 †Draze, E. S. ... The Grange, Haulton, Devonsh.
 Drewitt, T. ... Halfway House, Newbury, Berks.
 †Drewitt, George...Walberton, Arundel, Sussex
 †Drewitt, B. Dawtry...Burpham, Arundel, Sussex
 Drewitt, Thomas, jun. ... Guildford, Surrey
 Drinkwater, Richard, sen. ... Shrewsbury
 Driver, Edwd. ... Wilderwick House, East Grinstead
 †Driver, George Neale...8, Richmond Terrace
 Driver, Rolles...Southampton
 Druce, Joseph...Ensham, near Oxford
 Druce, Samuel...Ensham, near Oxford
 †Drummond, Andrew Robt. ... Cadland, New Forest, Southampton, Hants.

Drummond, Dr....104, Gloucester Pl., Portman Sq.
 Drummond, Rev. Arthur...Charlton Rectory, Black-
 heath
 Drury, George V...Eastbourne, Sussex
 Drury, Thomas...Shawbury, near Shrewsbury
 Drury, John Geo....St. George's Street, Canterbury,
 Kent
 Du Cane, Capt. C....Braxted Lodge, Kelvedon, Essex
 †Duckworth, Sir John, Bart....Wear House, near
 Exeter, Devonshire
 Duckworth, John...Barnet, Hertfordshire
 Duff, Adam...Morden Hill, Blackheath
 Duke, Charles...East Lavant, Chichester, Sussex
 Duke, Henry...Eamley, Chichester, Sussex
 Dumolo, John...Dunton House, Fazeley, Staffordsh.
 Duncalfe, R....Honington Grange, Shifnal, Shrops.
 †Duncombe, Hon. O., M.P....24, Arlington Street
 Dunn, Dr....Smithewick, Birmingham, Warwicksh.
 Dunn, Geo....Ellingham, Alnwick, Northumberland.
 Dunn, James...Dowsby Hall, Folkingham, Linc.
 Dunn, Richard...Ryden Farm, Evesham, Worcester.
 Dunn, Thomas...Richmond Hill, near Sheffield
 Dunne, Thomas, jun....Bircher, Leominster
 Dunning, R....Bishop's Burton, Beverley, Yorksh.
 Dunning, Richard...Levaton, South Tawton, near
 Exeter, Devonshire
 Dunning, William, jun....Friser Waddon, near Dor-
 chester, Dorsetshire
 Duppa, T....Cardington, House, Bridgenorth, Shrops.
 Duppa, Thos. Duppa...Longville, Church Stratton,
 Shrewsbury, Shropshire
 Dyer, George...East Tisted, Alton, Hampshire
 Dyke, George Potow...Christchurch, Hampshire
 Dyke, Henry A. Parade, near Monmouth
 Dyke, J. D....Glovers, near Sittingbourne, Kent
 Dymock, Rev. Edward...Penley Hall, near Elles-
 mere, Salop
 Dymoke, Sir Henry, Bt....Scrivelsby Court, Horn-
 castle, Lincolnshire
 Dyott, Capt....Frenford, Lichfield, Staffordshire

Eaden, Francis...Cambridge
 Eager, William...Newark Mill, Ripley, Surrey
 Eagle, Thomas...Blaxholsme, Banbury, Oxon
 Eales, Charles...Bristol
 Eames, John...Ashby-de-la-Zepch, Leicestershire
 Earl, John...Morbone, Sutton, Huntingdonshire
 Earle, Henry Francis...18, Henrietta Street, Caven-
 dish Square
 †Earle, Richard...Knowsley, Prescot, Lancashire
 Earle, Thomas...Tichenstock, near Aylesford, Hants
 Earle, W. H. B...Holton Park, Wheatley, Oxford
 Earp, John...Toton, near Nottingham
 East, Edwin...Streathay, Surrey
 East, Sir East Clayton, Bart...Hall Place, Maiden-
 head, Berkshire
 †Easthope, Sir John, Bart., M.P....Fir Grove, Wey-
 bridge, Surrey
 Easton, Richard...Moortown Farm, Canford, near
 Wimborne, Dorset
 Eaton, George...Spissworth, Norwich, Norfolk
 Edey, Thomas...Hawford West, Fenwickshire
 Edmonson, Edwin...Headingley Hill, Leeds, Yorksh.

Eddison, Henry...Gateford, Worksop, Notts.
 Eddison, William...Huddersfield, Yorkshire
 Eddowes, John...Grimmer, Shrewsbury
 Eden, John...Beamish Park, Chester-le-Street,
 Durham
 Edgar, Rev. M. G...Red House, Ipswich, Suffolk
 Edgell, Richard W...Milton Place, Egham, Surrey
 Edgington, Benjamin...2, Duke St., Southwark
 Edmeads, J...Hazells, Northfleet, Kent
 Edmonson, John...Grassyard Hall, Lancaster
 Edwardes, Hon. William...Edmondthorpe, Oakham,
 Rutlandshire
 Edwards, A. Thomas...Colchester, Essex
 Edwards, Frederick...Barnham, Thetford, Norfolk
 Edwards, G. Nigel...Henlow Grange, Biggleswade,
 Bedfordshire
 Edwards, Henry...Wood Hall, Sutton, near Wood-
 bridge, Suffolk
 Edwards, Henry...Winchester
 Edwards, Henry Martyn...Chapel Brampton, near
 Northampton
 Edwards, Sir John, Bart...Greenfields, Machynlleth,
 N. Wales
 Edwards, John...Ness Strange, near Shrewsbury
 Edwards, John...Uddington, Shrewsbury, Salop
 Edwards, Joseph...Ross, Herefordshire
 Edwards, O. H...Chesterford, Essex
 Edwards, Richard...Robby Hall, Liverpool
 Edwards, Samuel...Foxhall, Ross, Herefordshire
 Edwards, T...Compton House, Stockbridge, Hants
 Edwards, Thomas Downes...Hodgebatch, Bromyard
 Egerton, Col. Richard...Eaton Banks, Tarporley,
 Cheshire
 Egerton, Sir Philip de Malpas Grey, Bart., M.P....
 Oulton Park, Middlewich, Cheshire
 Egerton, Rev. Thos...Middle Rectory, Shrewsbury
 †Eland, Stephen Eaton...Manor House, Stanwick,
 Higham Ferrers, Northamptonshire
 Eldin, Joseph...Caterham Court, Godstone, Surrey
 Eley, C...Heathfield Farm, Hounslow, Middlesex
 Elgar, James...Wingham, Kent
 †Elkins, Joseph N...Elkington, Welford, North-
 amptonshire
 Ella, William...Wimeswold, Loughborough, Leices-
 tershire
 Elliot, A. S...Woodbine Cottage, Ryde, Isle of
 Wight, Hampshire
 Elliott, Evan...Marsh, Llandulph, Devonport
 Elliott, Jonathan...Sonning, Reading, Berks.
 Elliott, Wm...Berk House, Banhill, Hereford
 Elliott, Thomas Christopher...Southampton
 Elliot, John...Field House, Clifton, Bristol
 †Elliot, John...Chapel Brampton, nr. Northampton
 Elliott, John...Chichester, Sussex
 Ellis, Charles...Franklands, St. John's Common,
 Brighton, Sussex
 Ellis, George...Edmonston, Middlesex
 Ellis, George...Hatfield, Chesham, Essex
 Ellis, John...Liverpool
 Ellis, John...Beaumont Leys, near Leicester
 Ellis, John...Garn, Fwllhel, Carnarvonshire
 Ellis, Robt. R...Yalding, near Maidstone, Kent
 Ellis, Wm. J...Wickham, Berkeley, Gloucestersh.

- Ellison, John...Sedgwick, Kendal, Westmoreland
 Ellison, John...Sandbeck, Rotherham, Yorkshire
 Ellison, Michael...Sheffield, Yorkshire
 Ellison, W...Syzergh Castle, Kendal, Westmoreland.
 Ellman, Rev. H. J...Carlton Rectory, near Bedford
 Ellman, John...Glynde, Lewes, Sussex
 Ellman, R. H...Glynde, Lewes, Sussex
 Ellman, Thomas...Beddingham, Lewes, Sussex
 Elphick, William...Steining Court, Sussex
 Else, John...Holloway, near Matlock, Derbyshire
 Elsum, Thomas...Whittlesey, Cambridgeshire
 Elton, Sir Edw. Marwood, Bart...Widworthy Court, Honiton, Devon
 Elton, Robt. J...Whitestanton, Taunton, Somerset.
 Elves, H...Colesburne, Cheltenham, Gloucestersh.
 †Elves, Capt. Henry Cary...Spennel House, Kidderminster
 Elwes, J. M...Bossington House, Stockbridge, Hampshire
 Elwood, Isaac-Col. Charles W...Clayton Priory, Brighton, Sussex
 Elwood, Wm...Spittal, near Kendal, Westmoreland
 Emery, Charles...Burcot, Wellington, Shropshire
 Emery, George...The Grange, Banwell, Somersetsh.
 Emery, Richard...Huston Place, Storrington, Petworth, Sussex
 Emlyn, Viscount, M.P...Stackpole Court, near Pembroke, S. Wales
 Empson, Henry...West Ravensdale, Binbrook, Spital, Lincolnshire
 Emson, Robert...Cambridge
 England, Richard...Bingham, Wells, Norfolk
 Ennisken, Earl of...Florence Court, Fermanagh, Ireland
 Ennys, John...Dorchester, Dorsetshire
 Ensor, Henry...Barton Farm, Sherburne, Dorset.
 Ensworth, Thomas...Oxford
 Enys, John Samuel...Enys, near Penryn, Cornwall
 †Erie, Rev. C...Hardwick, Aylesbury, Bucks.
 Erne, Earl of...Crum Castle, Lisnakea, Fermanagh, Ireland
 Errington, John...High Warden, Hexham, Northumberland
 Esam, John...Sutton-on-Trent, Newark, Notts.
 †Escott, Bickham, M.P...Hartrow, Taunton, Somersetshire
 Etches, J. Clifford...Barton Park, near Derby
 Ethelstone, Rev. C. W...Up Lyme, Lyme Regis, Devon.
 Etheredge, Charles...Stanton, Norfolk
 Etheredge, Fred. Wm...Mill Hall, near Maidstone
 Etwell, William...Pentox, Andover, Hampshire
 Eustace, Lieut.-Gen. Sir William...Samford Hall, Braintree, Essex
 Evans, Rev. Charles...Blackwall, near Wilksworth, Derbyshire
 Evans, C. H...Flagwynn, near Beaumaris, Anglesey
 Evans, H. R., jun...Ely, Cambridge
 Evans, Isaac P...Griff, Coventry, Warwickshire
 Evans, John (Mayor of Aberystwith)...Lloversgrove, Aberystwith
 Evans, Owen...Tyn-y-Coed, Fwllhel, Carnarvonsh.
 Evans, Rich...Tyny Park, Cardiff, Glamorganshire
 Evans, Robt...Foleshill Road, Coventry, Warwicksh.
 Evans, Robt., jun...West Hallam, near Derby
 †Evans, R. W...Eyton Hall, Leominster
 Evans, Samuel...Darlly Abbey, near Derby
 Evans, Thos. B...Deane House, Euston, Oxon
 Evans, Thomas William...Allestree, Derby
 Evans, Rev. Wm...Pusey, Faringdon, Berkshire
 Evans, W...Glascoed, near Llanantffraid, Oswestry
 Evans, W...Cliffe Farm, Cowbridge, Glamorgansh.
 Evans, Wm...Guildhall Square, Carmarthen
 Evans, Wm...Roath, near Cardiff, Glamorganshire
 †Evans, Rev. W. E...Burton Court, Herefordshire
 Eve, Richard...Silsoe, near Bedford
 Eve, William...Manor Farm, North Ockendon, Romford, Essex
 Everard, Edward...Middleton, Lynn, Norfolk
 Everard, James Eidsen...Congham, Castle Rising, Norfolk
 Everard, Thomas...Hoe Fields, Thurlston, near Leicester
 Everett, Isaac...Capel St. Mary, Ipswich, Suffolk
 Everett, Jas. H...Biddesden House, near Andover, Hampshire
 Everitt, Isaac...South Creak, Fakenham, Norfolk
 Everitt, James...North Creak, Fakenham, Norfolk
 Everitt, Joseph...Feering, Kelvedon, Essex
 Evershed, John...Albury, Guildford, Surrey
 Evinson, T...Angel Inn, Chesterfield, Derbyshire
 Ewen, Thos. L'Estrange...Dedham, near Colchester, Essex
 Exall, Wm...Kate's Grove Iron Works, Reading, Berkshire
 Exley, William H...Wisbeach, Cambridgeshire
 Exton, John...Eastwell, Melton Mowney, Leicestershire
 Exton, Rev. R. B...Cretingham Vicarage, Suffolk
 †Eyre, Geo. Edw...Warrena, Stony-Cross, Southampton, Hampshire
 Eyre, Robert...Lyndhurst, Hampshire
 Eyton, Charles...Hendrod, Wantage, Berkshire
 Eyton, John Priys...Llanerch-y-Mor, Holywell, Flintshire
 Eyton, John Wynne...Lee's Wood, Mold, Flintshire
 Eyton, Thomas W...Caed-y-Glyn, Wrexham, Denbighshire
 Eyton, Thos. C...Donerville, Wellington, Shropsh.
 Eyton, William...Condover, near Shrewsbury
 Fagg, George...Bedfont, Middlesex
 Fair, James...Lytham, Preston, Lancashire
 Fair, Thomas...Frenchfield, Penrith, Cumberland
 Fairweather, Alex., M.D...Clifton, Bristol
 Fairhead, W. F...Totnam, Maldon, Essex
 Fairman, Joseph...Bishop Stortford, Hertfordshire
 Fairman, W. O...Gore House, Sittingbourne, Kent
 Faithful, Rev. Geo. D...Lower Heyford, Bicester, Oxon
 Faldor, Robert...Lidlington, Amptthill, Bedfordsh.
 Falkner, Edward Dean...Fairfield, near Liverpool
 Fane, Cecil...
 Fane, John...Wormsley, Watlington, Oxon
 Fanshaw, Rev. Charles S...Trinity Church, Southampton, Hants

- Fardell, Chas...Holbeck Lodge, Hloncastle, Linc.
 Fardell, John...Eastgate House, Lincoln
 Fardell, Rev. Henry...Wisbech, Cambridgeshire
 †Fardon, Henry Fothergill...The Firs, Bromsgrove, Worcestershire
 Farhall, John N...Tillington, near Petworth, Sussex
 Fargus, John...Bristol
 Farley, George...Henwick, near Worcester
 Farmer, Edw...Fazeley, Tamworth, Staffordshire
 Farmer, Rd...Sheldon, Birmingham, Warwickshire
 Farncombe, Edw...St. Leonards, Hastings, Sussex
 Farncombe, Geo...Bishopstone, Lewes, Sussex
 Farnham, E. B., M.P...Quorndon House, Loughborough, Leicestershire
 Farquharson, Hen. J...Langton, Blandford, Dorset.
 Farr, Wm...Plas-Llyslyn, Newtown, Montgomerysh.
 †Farr, Wm. W...Iford, Christchurch, Hampshire
 †Farmer, Edmund...Spore, Swaffham, Norfolk
 Farrer, James...Ingleborough, Settle, Yorkshire
 Farrer, Rev. Richard...Ashley, Rockingham, Northamptonshire
 Farrington, J. Nowell...Worden Hall, Chorley, Lancashire
 Farrow, William...Market Rasen, Lincolnshire
 Faulkes, Robert...Beckingham, Newark, Notts.
 Faulkes, Robt...Caythorpe, near Bingham, Notts.
 Faulkner, Chris. F. A...Bury Barns, near Burford, Oxon
 Faulkner, Fras. Macnamara...Blackheath, Kent
 Faulkner, John...North Hinksey, near Oxford
 Faulkner, T., jun...Queenford, Dorchester, Oxon
 Faux, J...Ould-Ashley, near Welford, Northampton.
 Fawcett, John...Durham
 Fawcett, John Wm...Sedburgh, Yorkshire
 Fawcett, Rev. Christopher...Boscombe Rectory, near Salisbury, Wiltshire
 Fawcett, Thos...Gate House, Dent, W. R. Yorksh.
 Fawdon, J...Tughall, near Alnwick, Northumberland.
 Fawkes, F. H...Farnley Hall, Otley, Yorkshire
 Fearn, Samuel Wright...Derby
 Fearnley, Fairfax...Bishopclee, Bawtry, Notts.
 †Fearnhead, P...26, Ely Place, Holborn
 Fielden, J...Wilton House, Blackburn, Lanca.
 Fielden, W., M.P...Feniscombe, Blackburn, Lanca.
 Fedden, William...Bristol
 Fell, Wm...The Close, Lichfield, Staffordshire
 Fellowes, H. A. W...Eggesford, Chumleigh, Devon.
 †Fellows, Hon. N...Eggesford, Chumleigh, Devon.
 Fenn, J. G...Ardleigh Rookery, Colchester, Essex
 Fennor, J...Vernham, Andover, Hants.
 Fenton, K...Caldecote Hall, Nuneaton, Warwicksh.
 Fenwick, Andrew R...Morpeth, Northumberland
 Fernie, George...Eron, near Oswestry
 Fernie, W...Park Place, Strangeways, Manchester
 Ferrers, Karl...Chartley Castle, near Lichfield, Staff.
 Ferris, Samuel...Bulkington, Devizes, Wilts.
 †Ferris, T...Manningford, Bohune, Pewsey, Wilts.
 †Ferris, William...Draycot, Pewsey, Wilts.
 Festing, R. Grindall...35, Green Park, Bath, Soms.
 Featherstonhaugh, Timothy...The College, Kirkswald, Perth, Cumberland
 Fettes, T. B. Wilson...Rawcliffe Hall, near Garstang, Lancashire
 Field, Frederick...38, Upper Marsh, Lambeth
 Field, Jas. Pope...Chesham Vale, Chesham, Bucks.
 Field, John...St. Albans, Hertfordshire
 Field, Jonathan...Laceby, near Limber, Linc.
 Field, Jos...Markgate Cell, Market Street, Beds.
 Field, William David...Uceby Grange, Barrow-on-Humber, Lincolnshire
 Field, William...The Vale, Chesham, Bucks.
 Fielder, Chas...Sparsholt, near Winchester, Hants.
 Fielding, Rev. H...Langley Rectory, near Derby
 Fielding, Jas...Denbigh House, Haslemere, Surrey
 Fiennes, Hon. W. T. T...Broughton Castle, Banbury, Oxon.
 Fifield, Job...Hill Park, near Romsey, Hants.
 Filder, James Moses...The Pages, Bezhill, Sussex
 Filliter, Geo...Trigon Hill, Wareham, Dorsetshire
 Finch, Charles...Cambridge
 Finch, The Hon. Col. John...The Castle, Berkhamstead
 Finch, Richard...Headington, near Oxford
 †Finch, Rev. W...Warboys, Huntingdonshire
 Fincham, Fred...Ravenhead Plate-Glass Works, St. Helen's, Lancashire
 Finden, Geo. Fred...254, High Street, Borough
 Finnemore, John...Ballyward, Blessington, Ireland
 Firmin, William...Colne Engaine, Essex
 Fisher, George...Cambridge Bank, Cambridge
 Fisher, Rev. R. W...Hill Top, Kendal, Westm.
 Fisher, Thomas...Kendal, Westmoreland
 Fisher, Thomas Hall...Cambridge
 †Fisher, Thomas Richard...Oxford
 Fishwick, Geo...Scorton, Garstang, Lancashire
 Fiske, E. F...Cambridge
 Fison, Cornell...Thetford
 Fitzgerald, H. T. G...St. Mary's Vicarage, Reading, Berkshire
 Fitz-Herbert, Sir Henry, Bart...Tisington Hall, near Ashbourne, Derbyshire
 Fitz-Herbert, William...Tisington Hall, near Ashbourne, Derbyshire
 Fitz-Hugh, Rev. W...Street, near Lewes, Sussex
 Fitz-Hugh, Thomas...Plas-Power, near Wrexham, Denbighshire
 Fitzroy, S. C. H...Sennowe Lodge, Guist, Norfolk
 Fitzroy, G...Grafton-Regis, Stony Stratford, Bucks.
 Flack, William...Water's Place, Ware, Herts.
 Fletcher, Alexander...Milbrook, Southampton
 †Fletcher, Major E. C...Ulcombe Place, Maidstone, Kent
 †Fletcher, Sir Henry, Bart...Ashley Park, Walton-on-Thames, Surrey
 Fletcher, J...Knippton, Melton Mowbray, Leicests.
 Fletcher, John...St. Michael's, near Liverpool
 †Fletcher, John Philip...Ashley Park, Walton-on-Thames, Surrey
 Fletcher, W...Radmanthwaite, Mansfield, Notts.
 Flight, Thomas...33, Upper Brook Street
 Flint, John...Leighton Buzzard, Bedfordshire
 Flint, W...Hemmington, near Kegworth, Leicests.
 Flower, George...Mansfield, Nottinghamshire
 Flowerdew, J. S...Hinderclay, near Botesdale, Suff.
 Floyd, Thomas...Fritford, Abingdon, Berkshire
 †Floyer, John...Stafford, Dorchester, Dorsetshire

Floyer, John... Hints, Tamworth, Staffordshire
 Floyer, Jno. W....Caukwell, near Horncastle, Linc.
 Foakes, Chas. L....Ramsden Bell House, Billericay, Essex
 Foley, Rev. R....Kingswinford House, Stourbridge, Worcestershire
 Folkes, Sir Wm. Browne, Bart....Hillington Hall, near Lynn, Norfolk
 Folkestone, Viscount...Longford Castle, Salisbury, Wiltshire
 Fookes, Henry, jun....Monkton, Blandford, Dorset
 Foord-Bowes, Rev. Dr. Timothy F....Barton Silsoe, near Bedford
 Footner, W. A....Romsey, Hampshire
 Forbes, Capt. J., R.N....Winkfield, Windsor, Berks.
 Forbes, Sir J. S., Bart....Pitaligo, Tettercairn, N. B.
 Ford, A. R....Ellie Hall, near Lancaster
 Ford, E. Darby....Stratford-on-Avon, Warwickshire
 Ford, John, jun....Preston Farm, Blandford, Dorset
 Ford, Richard S....Clifford's Wood, Stone, Staffs.
 Ford, William....Bailey Pit, near Monmouth
 Ford, William....10, West Square, Lambeth, Surrey
 Fordham, J. E....Melbourn Bury, Royston, Herts.
 Fordham, John George....Royston, Herts.
 Foreman, T....Acton-Burnell, Shrewsbury, Shrops.
 Formby, Rev. James....Frindsbury, Rochester, Kent
 Formby, Richard....Liverpool
 Forester, G. T....Ercall Magna, Wellington, Shrops.
 Forester, Rev. R. T....Elmby Lodge, Droitwich, Worcestershire
 Forrest, John....Stretton, near Warrington, Lancs.
 Forrester, George....Bryanston, Blandford, Dorset
 Forrester, John....Stammore Priory, Middlesex
 Forster, Capt. H....Southend, Sydenham, Kent
 Forster, John....18, Carey Street, Lincoln's Inn
 Forster, Robert....Tottenham Green, Middlesex
 †Forster, Samuel....Southend, Sydenham, Kent
 Foster, W....Burradon, near Rothbury, Northumb.
 Fort, George....Alderbury House, Salisbury, Wilts.
 Fortescue, Hon. G....Boconnook, Lostwithiel, Corn.
 Fortescue, H. R....Combe Royal, Kingsbridge, Devon
 Fosbrooke, Leonard...Ravenstone, Ashby-de-la Zouch, Leicestershire
 Fosbrooke, Thos....The Hagg, Staveley, near Chesterfield
 Foster, A....Warmwell House, Dorchester, Dorsets.
 Foster, E....Anstey Hall, Trumpington, Cambridge
 Foster, Ebenezer, jun....Cambridge
 Foster, G. E....Cambridge
 Foster, J....Bumbridge Street, Eling, Southampton
 Foster, J. W....Brackenborough House, near Louth, Lincolnshire
 Foster, Joseph....Witham, Essex
 Foster, Joseph....Newton Lodge, Wisbeach, Camb.
 Foster, J. W....Clapham, near Settle, Yorkshire
 Foster, Michael....Shelford, near Cambridge
 Foster, Richard, jun....Cambridge
 Foster, Richard....Castle, near Lostwithiel, Cornwall
 Foster, Robert Carr....28, John Street, Bedford Row
 Foster, William....Pottorhanworth, near Lincoln
 Foster, Wm. Carr....28, John Street, Bedford Row
 Foster, William....Hanworth, Sleaford, Lincolnshire

Foster, Wm....Wordsley House, near Stourbridge, Worcestershire
 Fothergill, Mark....40, Upper Thames Street, City
 Fothergill, Matthew...Cefmachder, Bedwelty, near Newport, Monmouthshire
 Fothergill, R....Lowbridge House, Kendal, Westm.
 Fothergill, Richard...Tredegar, Monmouthshire
 Fothergill, Rowland...Hensol Castle, Cowbridge, Merthyr-Tydvil, Glamorganshire
 Foulis, Sir Wm....Ingby Manor, Stokesly, Yorks.
 Foulkes, John....Milford House, Newtown, Montgomeryshire
 Fountain, Joseph....Rickmansworth, Herts.
 Fontaine, Bernard...Stoke Hammond House, Leighton Buzzard, Bedfordshire
 Fouracre, T. W....Dunston, near Taunton, Somerset.
 Fowke, William....Rugeley, Staffordshire
 Fowle, Wm....Market Lavington, Devizes, Wilts.
 Fowle, Rev. Henry...Chute Lodge, near Andover
 Fowler, Henry....Kingham, Chipping Norton, Oxon
 Fowler, F. E. H....28, Sackville Street, London
 Fowler, John...Clifton, Bristol
 Fowler, John Kersley, jun....Aylesbury, Bucks.
 Fowler, Marshall...Preston Hall, near Stockton-on-Tees, Durham
 Fowler, M....Little Bushy Farm, Stanmore, Middx.
 †Fowler, R. C....Guntton Hall, Lowestoft, Suffolk
 Fowler, Capt. R. M....Walliscot House, Whitchurch, near Reading
 Fowler, Thomas...Tottenham, Middlesex
 Fowler, W....Hemingford Grey, St. Ives, Huntingds.
 Fowler, Wm. M....Barford Hill, near Warwick
 Fowles, Wm....Red House, Hursley, Winchester, Hants
 Fownes, G...1, Grange Terrace, St. Michael's Grove, Brompton
 Fox, Baruch....Beaminster, Dorsetshire
 Fox, Rev. Dr....Queen's College, Oxford
 Fox, Francis....Tottenham, Middlesex
 Fox, Francis Kerr....Bristol
 Fox, Frederick F....Melbourne, near Derby
 Fox, George C....Grove Hill, Falmouth, Cornwall
 Fox, Hy. Hawes, M.D....North Woods, near Bristol
 Fox, Hy. Hawes...25, Berkeley Square, Bristol
 Fox, Robert...The Lodge, Wendover, Bucks.
 Fox, Samuel...Kendalls, near Elstree, Herts.
 Fox, W....Elfordleigh, Plympton St. Mary, Devon
 Foxwell, Thos. S....High Street, Shepton Mallet, Somersetshire
 Frampton, H....Oakens Wood, Dorchester, Dorsets.
 France, F....St. John's College, Cambridge
 Francis, Benjamin...High Street, Litchams, Norfolk
 Francis, Philip, jun....Moore, Crediton, Devonshire
 Francis, Samuel...Ford Place, Stifford, near Romford, Essex
 Francis, S. R. G....Porters, North Ockenden, near Romford, Essex
 Frankland, T....Whitley, near Reading, Berkshire
 Franklin, Edw. L....Ascott, near Benson, Oxfordsh.
 Franklin, Jno....Ewelme, near Benson, Oxfordshire
 †Franklin, R....Clemenstone, Bridgend, Glam.
 Franklin, Robt....The Park, Thaxted, Essex
 Franklyn, George Woodroffe...Bristol

Franklyn, John...Bristol
 Franks, George...Hunsdon, near Ware, Herts.
 Franks, James...Albury, Guildford, Surrey
 Franks, John William...Elstree, Herts.
 Fraser, Alexander...Gatwick, Crawley, Sussex
 Fraser, Alex...Middle Claydon, Winslow, Bucks.
 Fraser, Geo. G....Rodney Street, Liverpool
 Frear, Benjamin...Derby
 Frederick, Sir Rich., Bart....Burwood Park, Walton-on-Thames, Surrey
 Fredricks, Frederick...Dyffryn House, Neath, Glamorganshire
 †Freebody, W. Yates...9, Duke Street, Westminster
 Freeman, John...East Rudham, Rougham, Norfolk
 Freeman, J., jun...Wessensham, Rougham, Norfolk
 Freeman, John...Gaines, near Worcester
 Freeman, Thos....Henham, Wangford, East Suffolk
 Freeman, W. Peere Williams....Fawley Court, Henley-on-Thames, Oxon.
 Fremantle, Rt. Hon. Sir W. H....Englefield Green, Chertsey, Surrey
 Fremantle, Rev. W. R....Rector of Middle Claydon, Winslow, Bucks.
 Freme, James, jun...Shrewsbury
 French, Thomas...Eye, Suffolk
 French, Rev. W....Master of Jesus College, Camb.
 †Frere, Geo. Edw....Kelston Knoll, Bath
 Frere, Ph. H....Bursar of Downing College, Camb.
 Frewen, C....Brickwall House, Northiam, Rye, Sussex
 Frogley, Ralph Allen...Hounslow, Middlesex
 Frost, Henry...West Wrating, near Newmarket, Cambridgeshire
 Frost, Matthew...Baslow, nr. Chesterfield, Derbysh.
 Frost, W. F....Thorington Hall, Colchester, Essex
 Frumton, Chas....Beckford Hall, Tewkesbury, Gloucestershire
 Fry, John G....Warley Lodge, Brentwood, Essex
 Fry, Robert...Torkington, near Bristol
 Fryer, Wm. R....Lychnett, Poole, Dorsetshire
 Fudge, Thomas, jun...Bristol
 Fullagar, James...Milton, Sittingbourne, Kent
 Fullard, Thomas....Thorney, near Peterborough, Northamptonshire
 Fuller, Aug. E., M.P....Rose Hill, Robert's Bridge, Sussex
 Fuller, Hugh...Portslade, Brighton, Sussex
 Fuller, John...Beechamwell, Swaffham, near Thetford, Norfolk
 Fullerton, Colonel John...Thrybergh Park, near Rotherham, Yorkshire
 Fulljames, Thos...Hasfield Court, near Gloucester
 Fulljames, Thomas, jun...Spring Hill, Malsmore, Gloucestershire
 Fulshaw, Richard...Knighton, near Leicester
 Furniss, Lawrence...Birchill Farm, Bakewell, Derbyshire
 Fyson, Joseph...Abbot's Leigh, Chapel Hill, Bristol
 Fyson, Robert D....Fordham, Newmarket, Cambridgeshire
 Gabb, Baker...Llwyndy, near Abergevenny, Monmouthshire

Gabeil, Chas...Hollyfield, near Crickhowell, Brecknockshire
 Gage, Hon. William...Westbury House, Bishops Waltham, Hants
 Gaisford, William...Berkeley, Gloucestershire
 Gale, Edward M....Upham, near Bishops Waltham, Hants
 Gale, Richard Christopher...Winchester, Hants
 Gale, Wm. Farnbridge Hall, Maldon, Essex
 Gale, Wm. Hy...Grateley, near Andover, Hants
 Gale, Rev. W. W....Pyle Rectory, Shepton Mallet, Somersetshire
 Galpin, John...Dorchester, Dorset.
 †Galton, Darwin....Edstone Hall, ~~Sturton-on-Avon~~, Warwickshire
 Galton, E....Loxton Manor House, near Cross, Somersetshire
 Gambier, Charles S...9, Harley Street, Cavendish Square
 Gamble, John...Manor Farm, Shouldham, Thorpe, Norfolk
 Gamble, J. C....Sutton House, St. Helen's, near Prescott, Lancashire
 Game, John...Pointington, near Sherborne, Dorset.
 Gameau, John Edwin...Stilton, Huntingdonshire
 Gamlen, Wm. H....Hayne House, Tiverton, Devon.
 †Gandy, James...Heaves, near Kendal, Westmorland.
 Gape, Thos. Foreman...St. Albans, Hertfordshire
 Gataway, James...Durham Down, Bristol
 Garbett, Richard...Lawley, Wellington, Salop
 Gardener, J....Oxford Arms, Kington, Herefordshire
 Gardener, Wm....Ewell Court, Epsom, Surrey
 Gardiner, Captain...7, Wellington Street North
 Gardiner, George...Horsford, Norwich, Norfolk
 Gardner, A....Molland Ash, near Wingham, Kent
 Gardner, James...Adderbury, Banbury, Oxfordshire
 Gardner, James...Banbury, Oxfordshire
 Gardner, Robert...Leighton Hall, near Shrewsbury
 Gardner, Wm. Wells...Higgleswade, Bedfordshire
 †Gardom, T....The Yeld, Baslow, Bakewell, Derby.
 Garland, Captain Joseph...Stonesleigh, Winborne, Dorsetshire
 Garland, Jos....Worgret, near Wareham, Dorsetsh.
 Garlick, John...Gosberton, near Spalding, Linc.
 Garmston, John...Worcester
 Garne, Wm....Aldsworth, Northleach, Gloucestersh.
 Garnett, C....Low Sizeth, Kendal, Westmoreland
 Garnett, Joseph...Kendal, Westmoreland
 Garnett, Wm....Quernmore Park, near Lancaster
 Garnier, B. N....Drayton Lodge, near Norwich, Norfolk
 Garnons, Rev. C. W. L....Sydney College, Cambridge
 Garrard, John...Bure's Hamlet, Sudbury, Suffolk
 Garrard, Chas. B. D....Lama Hall, St. Albans, Herts.
 Garrard, James...Finner Place, Watford, Herts.
 Garratt, Francis...Ellacombe, near Torquay, Devon.
 Garratt, John...Bishop's Court, near Exeter, Devon.
 †Garratt, John, jun...Farringdon House, near Exeter, Devon.
 Garrett, John...Jekleton, Safron Walden, Essex
 Garrett, Rich., jun...Leiston, Suffolk
 Garrod, James...Wells, Somersetshire

- Garrod, Robert... Igswich, Suffolk
 Garsed, John... Cowbridge, Glamorganshire
 Garth, Rev. Richard... Farnham, Surrey
 Garth, Thomas C... Haine's Hill, Reading, Berks.
 Garton, John... Lumsdale, near Matlock, Derbyshire
 Garven, Edward... Warrington, Lancashire
 Gascoven, Geo... Birchmore, near Woburn, Beds.
 Gascoyne, Joseph... Derby
 Gaskell, W. P... Rolles Hould, West Wycombe, Buckinghamshire
 †Gatacre, Edward L... Coton, near Kidderminster, Worcestershire
 Gataker, George... Mildenhall, Suffolk
 Gater, C. H... Swathling, near Southampton, Hants
 Gater, Edward... Townhill, near Southampton
 Gater, W. B... West End, near Southampton
 Gates, George... Steyning, Sussex
 Gates, John A... Grange Farm, Sandstone, Ixworth
 †Gates, Richard... Marshall Vale, Bramley, Guildford, Surrey
 Gatrell, Wm. Verling... Lymington, Hampshire
 Gaudern, John... Earl's Barton, Wellingborough, Northamptonshire
 Ganssen, Robt. Wm... Brookman's Park, Hatfield, Hertfordshire
 Gawler, H... Ramridge Cottage, Andover, Hants
 †Gawne, Edward M... Kentraugh, Isle of Man
 Gawner, Francis... Coombe Wood, Kingston, Surrey
 Gayford, Dennis... Croxton, near Thetford, Norfolk
 Gayford, Geo... Rymer House, Thetford, Norfolk
 Gaynes, John... Filton, near Bristol
 Gazeley, James... St. Westwood, Watford, Herts.
 †Gee, Sir Wm. R. P., Bart... Oxen Meath, Tenbridge, Kent
 Gedge, Johnson... Bury St. Edmund's, Suffolk
 Gedney, John... Redenhall, Harleston, Norfolk
 Geldard, George A... Aikrigend, Kendal, Westmoreland
 Gelderd, John... Patterdale, Penrith, Cumberland
 George, James... Cotham, Bristol
 George, James Gilbert... Monmouth
 Gerrish, Thomas... Upton, near Andover, Hants
 Gervais, Rev. Francis... Cecil Agnacley, Co. Tyrone, Ireland
 Gething, Wm... St. Julian's, Newport, Monmouthsh.
 Gibaut, Moses... Mainland, St. Lawrence, Jersey
 Gibb, John... Old Weston Grange, Huntingdon
 Gibbon, Alexander... Stanton, near Coleford, Gloucestershire
 Gibbons, Edward... Minster, Isle of Thanet, Kent
 Gibbons, Joseph... Torquay, Liverpool
 Gibbons, Thomas... Wolstanton, Staffordshire
 Gibbons, Wm... Foxgrove Park, Beckenham, Kent
 Gibbs, Chas... Bishop's Lydeard, Taunton, Somerset
 Gibbs, Geo... 34, Down Street, Piccadilly
 †Gibbs, Geo... Belmont, near Bristol
 Gibbs, James... Great George Street, Bristol
 Gibbs, Joseph... Elmfield, near Oxford
 Gibbs, Thomas... Ampthill, Bedfordshire
 Gibbs, William, jun... Alveston Hall, Stratford-on-Avon, Warwickshire
 Gibbs, Wm... 13, Hyde-Park Street, London
 Gibbs, Wm... Ichenor House, Chichester, Sussex
 Gibson, Geo. John... Sandgate Lodge, Storrington, Petworth, Sussex
 Gibson, Richard... Belvoir Inn, near Grantham, Lincolnshire
 Gibson, Robert... Bagshot, Surrey
 Gibson, Thos... Basingthorpe, Grantham, Lincolnsh.
 Gibson, William... Kirkby Green, near Lincoln
 Giffard, Rev. Jas... Vicar of Wootton, near Barrow-on-Humber, Lincolnshire
 Gilbert, Rev. Alex... Cantley, Acle, Norfolk
 Gilbert, Major... Bartley Lodge, Southampton
 Gilbert, Henry... Hexgreave Park, Southwell, Notts.
 Gilbert, George... Colchester, Essex
 Gilbert, T. W... Six-mile Bottom, Newmarket, Cambs.
 Gilbert, Thomas... Marden, Devizes, Wilts.
 Gilbert, Wm... Chute, Hippencombe, near Andover, Hants
 Gilbertson, M... Elm Cottage, Egham Hill, Surrey
 Giles, A... Fitzroy Farm, Norton Fitzwarren, Taunton, Somersetshire
 Gill, George... Weston, Shrewsbury, Shropshire
 Gill, Geo., jun... Dacombe Court, Coffswood, near Newton Abbott, Devonshire
 Gillard, Wm. Peard... Oakhill, Somersetshire
 Gillespie, Robert... 33, York Place, Portman Square
 Gillett, John... Brails, Shipston-on-Stour, Warwickshire
 Gillett, Joseph Ashby... Banbury, Oxfordshire
 Gillett, William... Southleigh, Witney, Oxfordshire
 Gilliat, George... Horncastle, Lincolnshire
 Gilliat, William Henry... Liverpool
 Gillott, Thos... Stanton-by-Dale, near Derby
 Gilpin, Major Richard... Hockliffe Grange, Leighton Buzzard, Bedfordshire
 Gilstrap, J... Hawton, Newark, Nottinghamshire
 Ginders, Samuel... Ingestre, near Stafford
 Gingell, Wm. James... Somerset Street, Bristol
 Girdlestone, Rev. H... Salisbury, Wiltshire
 Girdlestone, Stead... Stibbington Hall, Wansford, Northamptonshire
 †Gisborne, Matt... Walton Hall, Burton-on-Trent, Staffordshire
 Gisborne, Thos. J., M.P... Horwich House, Buxton, Derbyshire
 Glsby, Henry... Elmstead, Bromley, Kent
 Gladstone, Robertson... Liverpool
 Glaister, Henry R... Bedale, Yorkshire
 Glass, James... Wootton, Devizes, Wiltshire
 Glaspoole, Capt. R... Filby, Norwich, Norfolk
 †Glegg, Bankerville... Backford, Chester, Cheshire
 Glegg, Jno. Bankerville... Wistington House, Monkshead, Congleton, Cheshire
 Glencross, William... Lustow, Liskeard, Cornwall
 †Glendinning, A... Ash Grove, Seven Oaks, Kent
 Glenn, John... Eaton, near Melton Mowbray, Leicestershire
 Glover, Rev. Frederick, R. A... Rector of Chilton, Dover, Kent
 Glover, John... Bangley, Tamworth, Staffordshire
 Glynne, Rev. Hy... Rector of Haselden, Flintshire
 Glynne, Sir Steph. Bart., M.P... Haselden Castle, Flintshire
 †Gobett, John... Iken Hall, Sarumham, Suffolk

- Goddard, Ambrose... The Lawn, Swindon, Wilts.
 Goddard, Edward... Cookham, Newbury, Berks.
 Goddard, Horatio N.... Cliffe, Wootton-Bassett, De-
 vizes, Wiltshire
 Goddard, William Gilbert.... Pentridge, Woodgates,
 near Blandford, Dorset
 Godfrey, George.... Childrey, Wantage, Berkshire
 Godfrey, Thos.... Chawley, near Oxford
 Godfrey, Thos. S.... Balderton, near Newark, Notts
 Godrich, Thos.... Netley Grange, Southampton
 Godsall, Philip W.... Iscoyd Park, Whitechurch, Salop
 Godsall, Thos.... King's Cople, near Ross, Herts.
 Godson, Richard.... Heckington, Sleaford, Lincs.
 Godwin, Rich. Bennett.... Long Eaton, Derbyshire
 Godwin, Shadrack.... Hemel Hempstead, Herts.
 Godwin, William.... Bossington, Stockbridge, Hants.
 Golborne, Wm.... Witcham, Ely, Cambridgeshire
 †Goldhawk, Rowland, jun.... Hasle Hall, Steer,
 Guildford, Surrey
 Goldsmith, John.... Ixworth, Suffolk
 Goldsmith, William.... 31, Parliament Street
 Gomme, John.... St. Julians, near St. Albans, Herts.
 Gonne, T. G.... 19, Gloucester Place, Portman Square
 Gooch, John Kerr.... East Tuttenham, Norwich
 Gooch, Stephen.... Honingham, near Norwich
 Goodacre, R.... Ullesthorpe, Lutterworth, Leicesters.
 Goodall, John.... Moss Fields, Whitechurch, Shrops.
 Goodall, Michael.... Evelith Manor, Shifnal, Salop
 †Goodden, J.... Over Compton, Sherborne, Dorset
 Goode, Edw.... Aston Court, Tenbury, Worcesters.
 Goode, George.... Croft Cottage, Carmarthen
 Goode, Hy. Phelps... Scotchwell, Haverfordwest,
 Pembrokeshire
 Goode, Wm.... Llangadock, Carmarthenshire
 Goodenough, Joseph... Godmanstone, Dorchester,
 Dorsetshire
 Goodhall, John, jun.... Normanton, Derby
 †Goodlake, T. Mills... Wadley House, Faringdon,
 Berkshire
 Goodliffe, Richard... Wood Walton, Huntingdon
 Goodman, Timothy... Warminster, Wiltshire
 Goodricks, Sir Fras. L. H., Bart.... Studley Castle,
 Aylesbury, Warwickshire
 Goodwin, Charles... King's Lynn, Norfolk
 Goodwin, C. J.... Heath, near Chesterfield, Derbys.
 Goodwin, Capt. Francis Green... Wigwell Grange,
 Wirksworth, Derbyshire
 Goodwin, George.... High House, near Chesterfield,
 Derbyshire
 Goodwin, George.... Langa, near Bingham, Notts.
 Goodwin, Rev. H. J.... Mappleton, near Ashbourne,
 Derbyshire
 Goodwin, Wm.... Birchwood, near Alfreton, Derbys.
 †Goodwin, Wm.... Kedleston, near Derby
 Goodwyn, S. C.... Huntingfield Hall, Yorkford, Suff.
 Gordon, Alexander... Linley Hall, Broseley, Salop
 Gordon, Charles... Heavitree, near Exeter, Devon
 Gordon, Rev. Lord George... Chesterton, Stilton,
 Huntingdonshire
 Gordon, Jas. Adam... Nais, near Bristol, Somerset.
 Gordon, John... Kettle House, near Cirencester.
 †Gough, John... Wickham Market, Suffolk
 †Gough, John... West Wittering, Chichester, Sussex
 Goring, Chas.... Wiston Park, Steyning, Sussex
 †Goring, Sir H. D., Bart. ... Highden, Shoreham,
 Sussex
 Goring, Mrs. M.... Wiston Park, Steyning, Sussex
 Gorringe, James... Selmiston, Lewes, Sussex
 Gorringe, J. P.... Eastbourne, Sussex
 Gorst, Charles... Sealand, near Hawarden, Flint.
 Gosford, Wm.... Everingham, Pocklington, Yorkshire
 Gosling, Bennett... Rochester Grove, Surrey
 Gosling, John... Bocking, Essex
 Gosling, R.... Hassobury, Bishops Stortford, Herts.
 Gosling, T.... 10, Chandos Street, Cavendish Square
 †Gotling, William... Mansfield, Notts.
 Goude, Henry... Dunstable, Bedfordshire
 Gough, Edward... Gravel Hill, Shrewsbury, Shrops.
 Gough, Frederick... St. Albans, Herts.
 Gough, R. D.... Yniscedwin, near Neath, Glamor.
 Gould, John... Poltimore, Exeter, Devon
 Gould, Richard... Hope Hall, near Manchester
 Gowan, George... 20, Park Crescent
 †Gower, Abel L.... Castle Malgwyn, Pembrokeshire
 Gower, A. W.... Hook, near Hartford Bridge, Hants.
 Gower, George... Dilham, North Walsham, Norfolk
 †Gower, J. Leveson... Bill Hill, Wokingham, Berks.
 †Gower, Robt. Fred.... Glandovan, Pembrokeshire
 †Gower, W. Leveson, jun.... Titsey Place, Godstone,
 Surrey
 Gowing, Edw.... Eye, Suffolk
 Graburn, R. S.... Walton-Gordano, Bristol, Somers-
 etshire
 Graburn, William... Barton-on-Humber, Lincs.
 Grace, H.... Gates Ewhurst, near Northiam, Sussex
 Grace, Henry Mills... Downend, near Bristol
 Grace, Jas.... Wardrobes, Princes Risborough, Bucks.
 Grace, Wm.... Saltwick, Morpeth, Northumberland
 Graddon, Wm.... Bratton House, South Molton,
 Devonshire
 Graine, W.... Highfield Lodge, Winchester, Hants
 Graham, James... Berstead Lodge, Bognor, Sussex
 Grain, Henry... Shelford, near Cambridge
 Grain, Peter... Shelford, near Cambridge
 Grain, Peter, jun.... Shelford, near Cambridge
 Granger, Henry... Canford, Westbury-upon-Trym,
 Bristol
 Granger, John... Stretham, Ely, Cambridgeshire
 Granger, Joseph... Stretham, Ely, Cambridgeshire
 Granger, Thos. W.... Stretham Grange, Ely, Camb.
 Grant, H. J.... The Gnoil Castle, Neath, Glamor.
 Grant, John... Manningford Bruce, Pewsey, Wilts.
 Grant, John... Dartmouth, Devonshire
 Grant, Jonathan... East Coulston, Devizes, Wilts.
 Grant, Joseph Cooke... Stamford, Lincolnshire
 Grant, Wm.... Litchborough, Tewkesbury, Northamp.
 Grantham, Stephen... Stoneham, Lewes, Sussex
 Grantham, Rev. Thos.... Bramber, Steyning, Sussex
 Granville, Bernard... Wellesbourne, Warwickshire
 Gratre, Thos.... Nonmouth
 †Gratwick, W. G. K.... Ham, Arundel, Sussex
 Graves, Robt.... Blackholm, Sleaford, Lincolnshire
 Graves, Robt.... Charlton, Shaftesbury, Dorsetshire
 Gray, Jno.... Wooperton House, Wooler, Northumb.
 Gray, Russell... Barcombe, near Lewes, Sussex
 Gray, Thos.... Oakington Farm, Harrow, Middlesex

- Gray, William... East Bolton, Alnwick
 Grazebrook, George... Stourbridge, Worcestershire
 Grazebrook, Joseph... 2, Park Row, Bristol
 Grazebrook, T. W. Smith... Dallicot House, Wolverhampton
 Greaves, James... Radcliffe, near Buckingham
 Greaves, John... The Grove, Ashbourne, Derbyshire
 Greaves, R... Shottery, Stratford-on-Avon, Warwick
 Greaves, William... Matlock-Bath, Derbyshire
 Green, F... Court Henry, Llandilo, Carmarthensh.
 Green, George... Millbrook, near Ampthill, Beds.
 Green, Rev. Geo. Wade... Court Henry, Llandilo, Carmarthenshire
 Green, James... Prescott, Lancashire
 Green, Richd... Depden, Bury St. Edmund's, Suffolk
 Green, Richd... Metheringham, nr. Lincoln, Lincs.
 Green, Robt... Odstone Hill, Measham, Ashby-de-la-Zouch, Leicestershire
 Green, Thos... 12, Queen Street, Bristol
 Green, Thos. Abbot... Pavenham, near Bedford
 Green, Rev. Thos... Vicar of Badby, Daventry
 Green, William... H 3, Albany, London
 +Greenall, G... Walton Hall, Warrington, Lancas.
 +Greenall, John... The Bank, Warrington, Lancas.
 Greene, Benj. Aislabie... St. Ives, Huntingdonshire
 Greene, John... Greenville, Co. Kilkenny, Ireland
 +Greene, T. M.P... Whittington Hall, Lancaster
 Greene, Capt. W. Burnaby... Wickham, Hants.
 Greenham, Jas... Blankney Fen, Lincoln
 Greenhow, John... Kendal, Westmoreland
 Greenway, Henry... Hambrook, near Bristol
 Greenwood, Chas... Wallingford, Berkshire
 +Greenwood, Fred... Ryelworth, Bradford, Yorksh.
 +Greenwood, Thomas... Stainfield Hall, Lincoln
 +Gregg, Gordon H. F... Trewarthenick, Tregony, Truro, Cornwall
 Gregory, A. F... Styvichal, Coventry, Warwickshire
 Gregory, Thomas... Cutslow, near Oxford
 Gregory, Thos... Meadow Place, Bakewell, Derbysh.
 Gregory, William... Cirencester, Gloucestershire
 Gregory, William... Heanor, near Derby
 Gregson, Brian Paget... Lancaster
 +Gregson, Mathew... Toxteth Park, Liverpool
 Grenville, Hon. and Rev. G. N... Master of Magdalen College, Cambridge
 Grey, Sir Chas. Edw., Bart... Governor of Barbadoes
 +Grey, The Right Hon. Sir George, Bart., M.P... Fallowdon, near Alnwick, Northumberland
 Gray, Jas... Kimmerston, near Wooler, Northumb.
 +Gray, Capt. Chas. Bacon... Styford, near Hexham, Northumberland
 Grey, Hon. B. N. Osborn De... Fawley, Southampton
 Grey, Hon. and Rev. F. De... Copdock Rectory, Ipswich
 Grey, Hon. G. De... Fawley, Southampton
 Grey, G. A... Milfield Hill, Wooler, Northumberl.
 Grey, J... Dilton House, Newcastle, Northumberl.
 Grey, Thomas R... Norton, near Stockton-on-Tees
 Griffin, J... Borough Fenn, Peterborough, Northamp.
 Griffin, Richard... Colehill, Amersham, Bucks.
 Griffin, Wm. Erwin... Werrington, Peterborough, Northamptonshire
 Griffinhoofe, Rev. T. S... Arkesden, near Bishops Stortford, Hertfordshire
 Griffith, C. D... Padworth House, Reading, Berks.
 Griffith, D. W... Bodegroves, Pwllheli, Carnarvonsh.
 Griffith, E. H... Ty-Newydd, near Denbigh
 Griffith, J... Llwynydur, Newcastle-Emlyn, Carmar.
 Griffith, Samuel Y... Oxford
 Griffiths, Edward... New Court, near Hereford
 Griffiths, Henry... Bryndafydd, near Swansea
 Griffiths, John... Coumd, near Shrewsbury
 Griffiths, Thomas J... Bishop's Castle, Salop
 Grime, Thomas... Ticknall, Derbyshire
 Grimmer, Fred... Thurlton Hall, Beccles, Suffolk
 Grimmer, H... Haddiscoe, Norfolk
 Groom, John... Hordley, Eilesmere, Salop
 Groom, R... 3, Henrietta Street, Cavendish Square
 Groome, Chas... Lyon's Farm, Sompting, Shoreham, Sussex
 Grose, Nica. M... Killibien, Gower, Glamorganshire
 Grove, E... Shenstone Park, Lichfield, Staffordshire
 Grove, James... Great Baddow, Essex
 +Grove, T... Fern House, Shaftesbury, Dorsetshire
 Grubbe, J. A. H... Windlesham, near Bagshot, Surre.
 Grundy, Joseph... Fenny Drayton, near Athlertone, Warwickshire
 Grutt, Collings de Jersey... Sark, near Guernsey
 Guildford, Thomas... Nottingham
 Gunner, William... Will Hall, Alton, Hampshire
 Gunning, Sir Robert... Horton, near Northampton
 Gunniss, Jackson... Spilsby, Lincolnshire
 Guppy, T. R... Cornwallis Terrace, Clifton, Bristol
 +Gurdon, Brampton... Grundsiburgh Hall, Woodbridge, Suffolk
 +Gurdon, Rev. Philip... Cranworth Rectory, Shipdham, Norfolk
 +Gurdon, W... 11, Crown-office Row, Temple
 Gurney, Charles... Launceston, Cornwall
 Gurney, John... Earldham, Norwich, Norfolk
 Gurney, R. H... Thickthorn, near Norwich, Norfolk
 Gutch, John M... Common Hill House, near Worc.
 Guthrie, Rev. John... Vicar of Colne, Wilts
 Guy, E... Branstone, Melton Mowbray, Leicestersh.
 Guy, John... Viddlevan Farm, Milford, Lymington
 Gwatkin, John... Parc-Behan, Tregony, near Truro
 Gwilt, Rev. Dan... Icklingham Rectory, Mildenhall
 Gwyn, H... Baglon House, Neath, Glamorganshire
 Gwyn, R. H... Astbury Hall, Bridgnorth, Shropsh.
 Gwyn, Wm. Bevan... Pibroath, near Carmarthen
 Gwynn, Edward... Wem, Salop
 Gwynne, Capt. A. L... Monachty, Cardiganshire
 Gyde, Alfred... Painewick, Stroud, Gloucestershire
 Hack, James... Torquay, Devonshire
 Hacker, John Heathcote... Leek, Staffordshire
 Hague, John... Cranbrook, Kent
 Haines, Edw... Stratton, Cirencester, Gloucestersh.
 Halcomb, William... Poalton, Marlborough, Wilts.
 Halcomb, W. H... Chilton, Hungerford, Berkshire
 Hale, Ed... Hambledon, near Horndean, Hants.
 Hale, Gervase Cressy... Albeton, Derbyshire
 Halfhide, George... Coventry Street, London
 +Halford, Rev. Thos... Downing College, Cambridge
 Halke, Rev. J... Weston-by-Welland, Northampton

- Halket, Geo... Wainskeel, Bridgend, Glamorgansh.
 Hall, Benj. E... Cilgwyn, Cardiganshire
 Hall, Charles... Ewell, Surrey
 Hall, C. M... Pill House, Chepstow, Monmouthshire
 Hall, Edward Lloyd G... Emlyn Cottage, Newcastle
 Emlyn, Carmarthenshire
 Hall, Francis... Park Hall, Mansfield, Notts.
 Hall, George... Parkhurst, Isle of Wight
 Hall, George... Ely, Cambridgeshire
 †Hall, Henry... Fritwell Manor House, Brackley
 Agho, Oxon
 Hall, James... Scarborough, Beverley, Yorkshire
 Hall, James... Kingsdown, Bristol
 Hall, J. W. R... Springfield, near Ross, Herefordsh.
 †Hall, John... Wiseton, near Bawtry, Notts.
 Hall, J. O... Brunswick Row, Bloomsbury
 Hall, John... Arnold Lodge, near Nottingham
 Hall, John... Kiverton Park, Sheffield, Yorkshire
 Hall, John... Writton Hall, St. Mary Magdalene,
 near Lynn, Norfolk
 Hall, John Hancock... Riseley Hall, Derby
 Hall, Joseph... Castleton, near Bakewell, Derbyshire
 Hall, Joseph... Callington, Bromyard, Herefordshire
 Hall, Lieut.-Col. (1st Life Guards)
 Hall, Richard... Cirencester, Gloucestershire
 Hall, Thomas... Hopton, Bakewell, Derbyshire
 Hall, Thomas... Theford, Norfolk
 Hall, Thomas... East Hanney, Abingdon, Berkshire
 Hall, Thomas Kirkpatrick... Holly-bush, Burton-on-
 Trent, Staffordshire
 Hall, Thos. L... Sepple Hall, Cleobury-Mortimer,
 Shropshire
 Hall, William... Santhorpe, Spilsby, Lincolnshire
 Hall, William... Ashton, near Leominster
 Hall, William... Waterbeach, Cambridgeshire
 Hall, William Willson... Landbeach, Cambridgesh.
 Hallam, John... Newcastle, Staffordshire
 Hallett, Job... Martock, Somersetshire
 Hallett, John James, M.D... Queen's Farm, Jersey
 Halley, Francis... Shifnal, Shropshire
 Hallows, Thos... Glapwell Hall, Mansfield, Notts.
 Halsey, Rev. J. F. Moore... Gaddesden Park, Hemel
 Hempstead, Hertfordshire
 Halsted, Thos... Woodcote, near Chichester, Sussex
 Halton, Rev. J... Winfield Manor, Alfreton, Derby.
 Halton, Rev. L. M... Woolhampton, Newbury,
 Berkshire
 Hamel, Dr. Joseph... Imperial Academy of Sciences,
 St. Petersburg and Moscow
 Hamer, David... Glanrafon, Oswestry, Salop
 Hamer, John... Glanrafon, Oswestry, Salop
 Hamersley, Hugh... Great Haseley, Tetsworth, Oxon
 †Hamerton, Capt. Arch... Rozelle, near Ayr, N.B.
 Hamilton, F... Kinsworth, near Market St., Herts.
 Hamilton, G. A., M.P... Hampton, near Balbrigan,
 Ireland
 Hammond, E... Ashley Hall, Newmarket, Cambrg.
 Hammond, G... Horshamden, Lamberhurst, Kent
 Hammond, Horace John... Lewis Heath, Horsham-
 den, Kent
 Hammond, J. W... Wistaston Hall, Nantwich, Chesh.
 Hammond, S... Andnam, Stourbridge, Worcestersh.
 Hammond, T... Penshurst, near Tonbridge, Kent
 †Hamond, W. Parker... Pampisford Hall, Cambr.
 Hampton, John... Coombs, Shoreham, Sussex
 Hampton, Robert... Wytheford, Shrewsbury
 Hanbury, E... Hackeston, Wickham Market, Suffolk
 Hanbury, John... Carborough, Lichfield, Staffordsh.
 Hanbury, Osgood... Coggeshall, Essex
 Hanbury, Osgood, jun... Lombard Street
 Hancock, Abraham... Hall Place, Kopley, near
 Alresford, Hampshire
 Hancock, J... Hulse, near Milverton, Somersetshire
 Hancock, Sir Samuel, Bart... Britwell House, Tets-
 worth, Oxon
 Hand, James... Ludlow, Shropshire
 Hand, Rob... Woolthorpe, Grantham, Lincolnshire
 †Handley, Major Benjamin... Pointon House, Fol-
 kingham, Lincolnshire
 Handley, W... Barford, near Warwick
 Handy, Edward... Sevenhampton, near Andovers-
 ford, Gloucestershire
 Handford, C. E... Woolas Hall, near Pershore, Worc.
 Hanham, Joseph Carey... East Pennard, Shepton
 Mallet, Somersetshire
 Hankey, J. Barnard... Fetcham, Leatherhead, Surrey
 Hankin, Daniel... Stanstead, Ware, Hertfordshire
 Hankin, Wm... Weller's Place, Bentworth, Alton,
 Hampshire
 Hankins, Thomas... Scarr, Newent, Gloucestershire
 Hammer, Colonel... Bear Place, Maidenhead
 Hammer, Sir John, Bart., M.P... Bettisfield, Whit-
 church, Salop
 Hannam, Charles... Northbourne Court, Deal, Kent
 Hannam, Geo. Emilus... Alland Grange, Minster,
 Thanet, Kent
 Hannam, Henry J... Burcot, Benson, Oxon
 Hannay, Rev. J... Ashley, Stockbridge, Hampshire
 Hannay, William... Park Hill, Nottingham
 Hanson, John... 346, Strand
 Harbin, George... Newton House, Yeovil, Somerset.
 Harbottle, J... Aniek Grange, Hexham, Northum-
 berland
 †Harcourt, G. G., M.P... Nuneham Park, near Oxfl.
 Harcourt, Capt. Octavius, R.N... Swinton Park,
 Bedale, Yorkshire
 Harcourt, W. B... St. Leonards, Windsor, Berkshire
 †Hardcastle, J... Bidworth Dale, Mansfield, Notts.
 Harding, Egerton William... Old Springs, Market
 Drayton, Shropshire
 Harding, G... Fern Hill, Market Drayton, Salop
 Harding, Geo... Blandford, Dorset.
 Harding, J... Roeliston, Burton-on-Trent, Staffs.
 Harding, James... Waterson, Dorchester, Dorset.
 Harding, James... Upton, Soudamore, Warminster
 Harding, John... Kingston Villa, Clifton, Bristol
 Harding, Joseph... Rodmead Farm, Maiden-Bradley,
 Mere, Wilts.
 Harding, J. Goldie... Monkleigh, Torrington, Devon.
 Harding, Samuel... Alraham, Tarporley, Cheshire
 Harding, Stephen T... Stinsford Farm, near Dor-
 chester, Dorset.
 Harding, Wm. C... Lower Winchendon, Aylesbury
 Hardman, Edw... Royal Dublin Society, Dublin
 Hardy, Joseph... Midville, Boston, Lincolnshire
 Hardy, J... Tendring Hall, Colchester, Essex

- Hardwicke, Charles C...Congresbury, near Bristol
 Hardy, T. E...Mason Street, Edge Hill, Liverpool
 Hare, Chas. Bowles...9, Saville Pl., Clifton, Bristol
 Hare, Jabez...10, Nelson Square, Southwark
 Hare, Charles James...Wormley Lodge, Waltham Cross, Hertfordshire
 Hare, Joseph...Wilton Farm, Beaconsfield, Bucks.
 †Hare, T...Springfield, Bristol
 Hare, Sir Thomas, Bart....Stow Hall, Downham Market, Norfolk
 Harewood, Earl of...Harewood House, London
 Harfield, Robert...Southampton
 †Harford, John S...Blaise Castle, near Bristol
 †Harford, W...Barley Wood, Wroughton, near Bristol
 Harland, W. C., M.P...Sutton Hall, York
 Harman, Charles...High Wycombe, Bucks.
 Harman, Edward...Enfield, Middlesex
 Harman, Rev. T...Bardon, near Tonbridge, Kent
 Harper, George...Belvidere, Whitechurch, Salop
 Harper, John...Isham, Kettering, Northamptonsh.
 Harper, John...Madley Manor, Newcastle-under-Lyne, Staffordshire
 Harper, Robt. John, jun...New Lodge, Needwood Forest, Burton-on-Trent, Staffordshire
 Harradine, John T...Needlingworth, Huntingdon.
 Harradine, Samuel...Hawnes, Ampthill, Beds.
 Harries, Francis, jun...Cruickton Hall, Shrewsbury
 Harries, Gilbert...Llanwnnes, Haverfordwest, Pembrokeshire
 Harris, Edw...Frankton, Dunclurh, Warwickshire
 Harris, Geo. H...Brooklands, near Torquay, Devon.
 Harris, Henry...High Ercal, Wellington, Salop
 Harris, Henry H...Park Lodge, Cambridge
 Harris, James...Long Sutton, near Odilham, Hants
 Harris, James...Alton Farm, Amesbury, Wiltshire
 Harris, John...Hinton, Abingdon, Berks.
 Harris, J...Springwell Cottage, Clapham Common
 Harris, Rich...Wootton Grange, near Northampton
 Harris, Sam...Longdon, near Shrewsbury, Shropsh.
 Harris, Thomas...Fitchamstead, Stoneleigh, Coventry, Warwickshire
 Harris, Wm...Weston, Leamington, Warwickshire
 Harris, Wm...Stoke-Prior, Bromsgrove, Worcestersh.
 Harrison, A...Laygate Cottage, South Shields, Northumberland
 Harrison, Daniel...Kendal, Westmoreland
 Harrison, George...Barton, Dover, Kent
 Harrison, Jas...Crimble, near Rochdale, Lancashire
 Harrison, James...Lowfields, Kirby-Lonsdale, Westmoreland
 Harrison, John...Derby
 Harrison, Rev. J...Dinton, Aylesbury, Bucks.
 Harrison, John...Snelston, nr. Ashbourne, Derbysh.
 Harrison, John...The Banks, Bakewell, Derbyshire
 Harrison, John, jun...Snelston Hall, near Ashbourne, Derbyshire
 Harrison, John B...Douglas, Isle of Man
 Harrison, John Geo...Home Farm, Stow Bardolph, Norfolk
 †Harrison, R...Wolverton, Stony Stratford, Bucks.
 Harrison, Thomas...Rusley, Derby
 Harrison, Thomas...Norris Green, West Derby, Liverpool
 Harrison, Thos...Salthellwyd, Holywell, Flintshire
 Harrison, William...Walsall, Staffordshire
 Harrison, William...Bagworth Park, near Leicester
 Hart, C...Wantage, Berkshire
 Hart, Capt. Francis, R.N...Wimpole, Arrington, Cambridgeshire
 Hart, Henry P...Beddingham, Lewes, Sussex
 Hart, John Geo...Stowmarket, Suffolk
 Hart, Thos...Wing, near Leighton Buzzard, Beds.
 Hart, Thos. Fred...Burham House, East Hoathley, Hurst Green, Sussex
 Hart, Thos. P...Housham Hall, Matching, Harlow, Essex
 Hart, W...32, Brunswick Square, Brighton, Sussex
 Hartley, Gilford...Rose Hill, Whitehaven, Cumb.
 Hartsborne, T...Silkmore House, Stafford
 Hartt, Jas...Billingford, Elmham, Dereham, Norfolk
 Harvey, Chas. W...2, Dale Street, Liverpool
 Harvey, Edw. N...Over Ross, Ross, Herefordshire
 Harvey, John...Hiemsworth, Wimborne, Dorset.
 Harvey, John...Ickwelbury, Biggleswade, Beds.
 Harvey, Mathew...Balderton, Newark, Notts.
 Harvey, Richard S...Corn Hill, Lincoln
 Harvey, Robert Blyth...Harleston, Norfolk
 Harvey, Robert E...Walton Priory, near Liverpool
 Harvey, Robert R...Sturminster, Newton Castle, Blandford, Dorsetshire
 Harvey, T...Kegilliac, near Falmouth, Cornwall
 Harvey, W. F...Purbrook, Heath, near Portsmouth
 Harward, Rev. Thos...Winterfield, Kidderminster, Worcestershire
 Harwood, Edw...Woodhouse, Almond Street, Olveston, Bristol
 Harwood, S...Madley Hall, Ashbourne, Derbysh.
 Haselfoot, R. C...Boreham, Chelmsford, Essex
 Haslam, John...Chesham, near Bury, Lancashire
 Haslam, Samuel H...Greenside Cottage, Milnthorpe, Westmoreland
 Haslar, Richard...Aldingbourne, Chichester, Sussex
 Hasleden, John...Liverpool
 Hassall, Wm...Hadley, Whitechurch, Salop
 Hassell, Charles...Bristol
 Hassell, John...Shelford Manor, Nottingham
 Hastings, John...Longham, near East Dereham, Norfolk
 Hastings, John Kerr...Hereford
 Hatcher, John...Marlewood, Thornbury, Bristol
 Hatfield, Charles T...Harrisdown House, near Margate, Kent
 Hatfield, R...Thorp Arch Hall, Wetherby, Yorksh.
 †Hatfield, Wm...Newton Kyme, Tadcaster, Yorksh.
 Hathorn, John...Worsley, Manchester, Lancashire
 Havers, Wm...Bacon's Farm, Mountnessing, near Ingatestone, Essex
 Hawker, Admiral E...Ashford Lodge, Petersfield, Hampshire
 Hawkins, H. M...Tredunnoch, Usk, Monmouthsh.
 Hawkins, J. H...Dorchester, Dorset.
 †Hawkins, Thos...Assington Moor, Sudbury, Suffolk
 Hawkins, Wm...Wexcomb, Ot. Bedwin, Wilts.
 Hawkins, Wm. W...St. Botolph's, Colchester, Essex
 Haworth, S. R...21, High Street, Hull, Yorkshire
 Hayden, James...Arrington, Cambridgeshire

- Haydon, Joseph... Guildford, Surrey
 Haydon, Josiah... Baldock, Hertfordshire
 Haylock, J.... Balsham, near Linton, Cambridgesh.
 Hayne, John... Ferdington, Dorchester, Dorset.
 Hayne, Capt. Rich.... Commissioner of New Brunswick Land Company, Stanley, New Brunswick
 Haynes, Henry... Whittlesey, Cambridgeshire
 Haynes, Wm... Handborough, Woodstock, Oxon
 Hayward, D. S... Frocester Court, Stroud, Glouc.
 Hayward, George... Walford Mause, Shrewsbury
 Hayward, Harry... Wilsford, Devizes, Wiltshire
 Hayward, J... Worcester
 Hayward, John... Hisland, Oswestry, Shropshire
 Hayward, Johnston... Etchelhampton, Devizes, Wilts.
 Hayward, J. C... Quedgeley House, near Gloucester
 Hayward, Joseph... Beechingstoke, Devizes, Wilts.
 Hayward, R. F... Deene, Wansford, Northamptonsh.
 Hayward, Thomas... Wellingore, near Lincoln
 Hayward, W. P... Wilsford, Devizes, Wilts.
 Hayward, William Turner... Carshalton, Surrey
 Haywood, James... Derby
 Hazard, Henry... Cambridge
 Heacock, Philip... Buxton, Derbyshire
 Head, Wm. Alston... East Grinstead, Sussex
 Headlam, T. E... Mayor of Newcastle-on-Tyne
 Headly, Henry... Cambridge
 Headly, James... Cambridge
 Headly, Richard... Stapleford, near Cambridge
 Heard, W... St. Margaret's, Ware, Herts.
 Hearn, John Henry... Newport, Isle of Wight
 Hearne, Stephen S... Broom, Alcester, Warwicksh.
 Hearsey, Rich... Greattham, near Petersfield, Hants
 Heath, Rev. Chas... Hanworth Vicarage, Aylsham, Norfolk
 Heath, Henry... Amersham, Bucks.
 Heath, Samuel... Frankton, Southam, Warwickshire
 Heath, Mr. Sergeant... Kitlands, Dorking, Surrey
 Heath, Wm... Salford, Bidford, Stratford-on-Avon, Warwickshire
 Heathcote, A. H... Blackwell, Bakewell, Derbyshire
 Heathcote, C... The Green, Ashbourne, Derbyshire
 †Heathcote, J. Moyer... Connington Castle, Stilton, Huntingdonshire
 Heathcote, R. Bayterby, nr. Atherstone, Warwicksh.
 Heathcote, Rev. S... Bramshaw Hill, Stoney Cross, Southampton
 Heathcote, W. A... Rolleston, near Salisbury, Wilts.
 Heaton, Chas... Endon, Leek, Staffordshire
 Heaton, Thos... Endon, Leek, Staffordshire
 Hedding, James... Manor Farm, Chawson, near St. Neots, Huntingdonshire
 Heelis, Thos... Skipton Castle, Yorkshire
 Hegan, Joseph... Liverpool
 Hellier, James Shaw... Barnhurst, Wolverhampton, Staffordshire
 Helps, Richard... Gloucester
 Helyar, C. J... Poundisford Lodge, Taunton, Soms.
 Hemming, Rev. G... Little Parndon, Harlow, Essex
 Hemming, W... Fox Lydiate House, Bromsgrove, Worcestershire
 Hemming, W. K... Lisimore Castle, Co. Waterford, Ireland
 Hemmaley, Joseph... Bath Hotel, Clifton, Bristol
 Hemsworth, H. D'Estere... Shropham Hall, Larlingford, Norfolk
 Henchman, Fras... Kew, Surrey
 Henckel, Count Hugo... Donnesmark, Siemianowitz, Königshutte, Prussia
 Henderson, Colonel... Mayor of Southampton
 Henderson, Edward... Lowick, Wooler, Northumb.
 Henderson, James... Editor of the 'Newry Telegraph,' Ireland
 Henderson, Matthew... Haydon Bridge, Northumb.
 Henderson, R... Laugh's Ford, Wooler, Northumb.
 Hendrie, George... Knowsley, Prescott, Lancashire
 Hendy, James... Trethurffe, near Truro, Cornwall
 Heneage, Geo. H. Walker, M.P... Compton Bassett, Calne, Wiltshire
 †Henley, Jos. Warner, M.P... Waterperry, near Wheatley, Oxon.
 Henning, Jas... Wolveton, Dorchester, Dorsetshire
 Henning, W. L... Frome House, Dorchester, Dorset.
 Henson, J... Walton, Loughborough, Leicestershire
 Henty, Robert... Chichester
 Herapath, William... Old Park, Bristol
 Herbert, John... Powick, near Worcester
 Herbert, Robt... 7, Chrysell Road, North Brixton
 Hercy, John... Hawthorn Hill, Maidenhead, Berks.
 Herrick, William... Beau Manor Park, Loughborough, Leicestershire
 Herring, John Barnwell... South Barnham, Walsingham, Norfolk
 Herring, P. B... Finchley, Middlesex
 Hersee, Dennett... Burpham, near Arundel, Sussex
 Hervey, Wm... Bradwell Grove, near Burford, Oxon
 Heseltine, Wm... Worlaby House, Barton, Lincolnsh.
 †Hester, G. P... Town Clerk's Office, Oxford
 Hetley, H... Long Orton, Peterborough, Northamptonsh.
 Hester, Wm., jun... Northleach, Gloucestershire
 Hewitt, Henry... Coal-pit Heath, Bristol
 Hewitt, R... Doldford, Weedon, Northamptonshire
 Hewitt, William... Coal-pit Heath, Bristol
 Hext, Thos... Restormal Park, Lostwithiel, Cornwall
 Hextall, Jas... Snibstone, near Ashby-de-la-Zouch, Leicestershire
 Heyes, John... Prescott, Knowsley, Liverpool
 Heysham, Rev. J... The Abbey, Carlisle, Cumberland
 Heytesbury, Lord... Heytesbury, Wiltshire
 †Heywood, Sir Benjamin, Bart... Claremont, near Manchester
 Heywood, James... Hanbury, Worcestershire
 Heywood, John Thos... Brimington, near Chesterfield, Derbyshire
 Heyworth, Rev. J... Henley Grove, Westbury, Bristol
 Heyworth, Ormerod... Everton, Liverpool
 †Hibbert, John, jun... 47, Great Ormond Street
 Hibbert, Nathaniel... Munden, Watford, Herts
 Hickman, Capt... Old Swinford, Stourbridge, Worcestershire
 Hickman, Harvey... Colnbrook, Buckinghamshire
 Hickman, Rev. H... Walton-on-Thames, Surrey
 Hicks, J... Walton Hall, Thorpe, Essex
 Hicks, Leonard... Paddock Lodge, Kentish Town
 Hickson, Chas... Apsley Place, Ardwick, Manchester
 Hickson, Rich... Hougham, Grantham, Lincolnsh.
 Higgins, Rev. E... Bosbury Ho., Ledbury, Herefordsh.

- Higgins, Henry....Much Fawley, Ross, Herefordsh.
 Higgins, John....Alford, Lincolnshire
 Higgins, Thos. Chas....Turvey House, Bedford
 Higgins, W. W....Fairfield, Hambledon, Hordean,
 Hants
 Higgins, W. B....Pict's Hill, Turvey, Bedford
 †Higginson, Edmund....Salmarsh, Bromyard
 Higginson, Jonathan....Derby House, Rock Ferry,
 Cheshire
 Higginson, Rev. J....Thormanby Rectory, Thirsk,
 Yorkshire
 Highmore, J. N....Preston, Yeovil, Somersetshire
 Hilder, James....Bodiam, Staplehurst, Sussex
 Hilder, John....Sandhurst, Kent
 Hilder, Thos....Robertbridge, Battle, Sussex
 Hilditch, George....Treflack Hall, Oswestry
 Hildred, William....March, Cambridgeshire
 Hildyard, Colonel....Stokesley, Yorkshire
 Hill, Charles....Winceby, Horncastle, Lincolnshire
 Hill, Charles....The Poplars, Wellingborough
 Hill, Charles....Stainfield, Wragby, Lincolnshire
 Hill, Rev. Copinger....Buxhall, Stow Market, Suffolk
 Hill, Clement Delves....Sandford Hall, Salop
 Hill, Edw....Brierley Hill Iron Works, near Dudley,
 Worcestershire
 Hill, Edward....63, Gray's Inn Lane
 Hill, Rev. John....The Citadel, Hawkstone, Shrews-
 bury, Salop
 Hill, Hon. R. N....Cronkhill, near Shrewsbury
 Hill, Robt. Broadhurst....Breckfield House, Everton
 Breck, Liverpool
 Hill, Sir Robt. Chamber, Knt....Prees Hall, Shrews-
 bury, Shropshire
 Hill, Rd. Clarke....Stallington, Stone, Staffordshire
 Hills, Henry....Span, Godshill, Isle of Wight
 Hillyard, C....Thorpeplands, near Northampton
 Hilton, Giles....Lord, Faversham, Kent
 Hilton, Henry....Sole Street House, Selling, Faver-
 sham, Kent
 Hinchman, John....Charlcott, Bridgenorth, Salop
 Hincks, John....Leicester
 Hincks, R. R....Hackleton, near Northampton
 Hincks, T. C....Breckenborough, Thirsk, Yorkshire
 Hind, James....Lutterworth, Leicestershire
 Hinde, Geo. T. Preston....Harmston Hall, Lincoln
 Hindmarsh, Wm. C....West Horton, near Woolley,
 Northumberland
 Hinds, Chas....Perth, Western Australia
 Hingston, Jas....Frostden Hall, Wangford, East
 Suffolk
 Hinton, Wm. Hall....Daglingworth, Cirencester,
 Gloucestershire
 Hinxman, John....Sailbury Grove, Middlesex
 Hipkin, John....Singleton, near Midhurst, Sussex
 Hippisley, Edw. Burgess....Chewton Mendip, Bath,
 Somersetshire
 †Hirst, Godfrey....Longdon Hall, Knowle, Warwick.
 Hitchcock, Henry....Overton, Marlborough, Wilts.
 Hitchcock, Simon....Stanton St. Bernard, Devizes,
 Wiltshire
 Hitchcock, W. Henry....Boddycott House, Banbury,
 Oxon
 Hitchman, W. Simpkins....Chipping Norton, Oxon
 Hoare, George Wm....The Lodge, Morden; Surrey
 Hoare, Henry Chas....7, York Street, St. James's
 Hoare, Sir Hugh Richard, Bart....Lillingstone, Tow-
 cester, Northumberland
 Hoare, Capt. Nicholas....Wavendon, Fenny Stratford
 Buckinghamshire
 Hobbs, B....Earls Colne, near Halstead, Essex
 Hobbs, Henry....Bocking, Braintree, Essex
 Hobbs, Wm....Bocking, Braintree, Essex
 Hobbs, Wm....Hythe, Kent
 Hobbs, William Fisher....Marks Hall, Kelvedon,
 Essex
 Hobgen, Chas....Siddlesham, Chichester, Sussex
 Hobgen, J., jun....Aldingbourn, Chichester, Sussex
 Hobhouse, Henry....9, King's Bench Walk, Temple
 Hobly, D. P....Colquitta, near Bodmin, Cornwall
 Hobson, Edward....Syston Court, near Bristol
 Hobson, J....Eaton Scron, St. Neot's, Huntingdah.
 Hobson, Matthew....Ilkeston, near Nottingham
 Hobson, Wm. E....Kettleby-Thorp, Brigg, Linc.
 Hoeken, Rev. W....Great Endelion, Camelford,
 Cornwall
 Hoddenett, James....Silberlake Farm, Sherborne,
 Dorsetshire
 Hodding, Edw. Davis....Odstock, Salisbury, Wilts.
 Hodding, Matthias Thos....Fryem Court, Salisbury
 odge, Henry....Bossistow Vale, near Penzance,
 Cornwall
 Hodge, L. L....2, Upper Seymour Street West
 Hodgkinson, John....Hardwicke, near Chesterfield,
 Derbyshire
 Hodgkinson, R., sen....Morton Grange, Retford,
 Nottinghamshire
 Hodgkinson, R., jun....Osberton Grange, Retford,
 Nottinghamshire
 Hodgson, Isaac Scott....Whithorn, Charlton Kings,
 Cheltenham
 Hodgson, Joseph....Biggins' Old Hall, Kirby Lons-
 dale, Westmoreland
 Hodgson, Jos....Holme Hall, Bakewell, Derbyshire
 †Hodgson, William....Wanstead, Essex
 Hodsen, James....Falmer Court Farm, Lewes, Sussex
 Hodsen, James, jun....Falmer Court Farm, Lewes
 Hodson, John....Upwell, Cambridgeshire
 Hodson, Rev. J. J....Yelvertoft Rectory, Welford,
 Northamptonshire
 Hodson, William....Ford, near Lewes, Sussex
 Hoff, William....Halston, Spilsby, Lincolnshire
 Hogarth, John....Akeid, Woolley
 Hogg, Frederick....Girtford, near Biggleswade, Beds.
 Hogg, Wm....Biggleswade, Bedfordshire
 Hoggins, Thos....Trafford Lodge, near Chester
 Holbrook, Chas....Alvaston, near Derby
 Holcombe, Rev. George Francis....Brinkley, New-
 market
 Holden, Edw. A....Aston Hall, Derby
 Holden, Robt., jun....Locko Park, near Derby
 Holder, John....Cubberly, near Ross, Herefordshire
 Holding, Henry....Shaldon, near Alton, Hants
 Holdsworth, George....2, Upper Dorset Place, Clap-
 ham Road, Kennington
 Holdsworth, R....East Woodhay, Newbury, Berks.
 Hole, Jas....Knowle House, Dunster, Somersetshire

- Hole, Sam...Cauntton Manor, Newark, Nottingham.
- Hole, William...Clare House, Tiverton, Devonshire
- Holladay, James...Liverpool
- Holland, S., jun...Plasy Penrhyn, Port Maddock, Carnarvonshire
- Hollier, W...Walton, near Burton-on-Trent, Staffs.
- †Hollist, Hasler...Lodsworth, Midhurst, Sussex
- Holloway, Horatio...Marchwood, Southampton
- Holman, John...Glastonbury
- Holmes, Alfred William...Derby
- †Holmes, Hon. W. A'Court...Westover, Newport, Isle of Wight
- Holmes, W. S...Redenhall, Harleston, Norfolk
- Holton, George...Wiston, Sudbury, Suffolk
- Homer, J...Martinstown, near Dorchester, Dorsetsh.
- Hornfray, J...Llandaff House, Cardiff, Glamorgansh.
- Hornby, W. Henry...Itchington, Tytherington, Gloucestershire
- †Hony, Rev. P. F...Athenæum Club, London
- Hony, Rev. W. E...Baverstock Rectory, Salisbury
- Honywood, Rev. P. J...Marks Hall, Coggeshall, Essex.
- Hood, Hon. A. N...12, Wimpole Street
- Hood, D...Whitbury, near Fordingbridge, Hants.
- Hoole, Benjamin...Norton Hall, Worcester
- Hooper, George, jun...Cottingham, near Deal, Kent
- Hooper, Wm...West Lavington, Devizes, Wiltshire
- Hope, Thomas Henry...Netley, Shrewsbury
- Hoper, John, jun...Shermanbury, Horsham, Sussex
- Hopkins, Rev. D. J...Hartford, near Huntingdon
- Hopkins, J...Tidmarsh House, Reading, Berkshire
- Hopkinson, Dr...Stanford, Lincolnshire
- Hopkinson, Frederick...Benningholme, Hull, Yorkshire
- Hopkinson, Luke...10, Bedford Row
- Hopper, John Mason...Newham Grange, near Stockton-on-Tees
- Hopton, Rev. John...Canon-Frome Court, Ledbury, Herefordshire
- Hopton, Rev. W. P...Bishop's Frome, near Bromyard, Herefordshire
- Horcler, Alex...Osley, Wolverhampton, Staffordsh.
- Horlock, J. W...The Rocks, Marshfield, Tetbury, Gloucestershire
- Horlock, K. W...Ashwick, near Bath, Somersetsh.
- Hornby, H...Ribby Hall, Kirkham, Preston, Lanc.
- Hornby, Joseph...Everton, near Liverpool
- †Hornby, Rev. R...Walton-le-Dale, Preston, Lanc.
- Horneastle, John, jun...The Yews, Tickhill, Rotherham, Yorkshire
- Hosmer, Rev. John...Mells Park, Frome, Somerset.
- Hornsey, Rich...Spittle Gate, Grantham, Linc.
- Hornsey, R., jun...Spittle Gate, Grantham, Linc.
- Hornvold, Thos...Blackmoor Park, Great Malvern, Worcestershire
- Horsburgh, Jas...Horne Hill, near Dulwich, Surrey
- Horton, Rev. J. T...The Viesage, Ormskirk, Lanc.
- Horton, R...Andley End, Saffron Walden, Essex
- Horswood, John...Stean Park, Brackley, Northamp.
- †Hookins, T...Hazelbury, Crewkerne, Somersetshire
- †Hookins, W...North Parrott, Crewkerne, Somerset.
- Hoskins, C., M.P...Birch House, Ross, Herefordsh.
- Hoskins, Charles W...Wroxall Abbey, Warwick.
- Hoskins, Derick...Bewick House, Bougham, Norfolk
- †Houblon, Richard A...Coopersall, Epping, Essex
- Houghton, Henry...Baginton, Coventry, Warwickshire
- Houghton, John...Broom Hall, Sunninghill, Berks.
- Houldsworth, Henry...Coltneß, Wishaw, N. B.
- Houldsworth, Thomas, M.P...Portland Place, Manchester, Lancashire
- Houldsworth, Wm...Farnesfield, Southwell, Notts.
- House, John, jun...Quarleston, Blandford, Dorset.
- How, Wm...Hammond's End, Harpenden, Herts.
- How, William Wyburgh...Shrewsbury
- Howard, Charles...Monkgate, York
- Howard, Hon. Col. F. G...16, Grosvenor Square
- Howard, George...Hemel Hempstead, Hertfordshire
- †Howard, Hon. Capt. H...Charlton, Malmesbury, Wiltshire
- †Howard, H...Greystoke Castle, Penrith, Cumberl.
- Howard, H...Saint Cross, near Winchester, Hants.
- Howard, Hon. James...Hazelby, near Newbury
- Howard, John...Bretton Hall, Sandbach, Cheshire
- Howard, John...Bedford
- Howard, Joseph...Aylesbury, Buckinghamshire
- Howard, T. A...Yattendon, near Newbury, Berks.
- Howard, W...Newcastle-upon-Tyne, Northumberl.
- Howell, Henry...Driffield, Cheneester, Gloucestersh.
- Howell, John D...Stow, near Monmouth
- Howells, Captain...Cardiff, Glamorganshire
- Howells, Thomas...Fox Farm, near Shrewsbury
- Howells, H. Williams...Glassport, near Newcastle Emlay, S. W.
- Howey, T...Lilburn Grange, Wooler, Northumberl.
- Hoy, Barlow J...Thornhill Park, near Southampton
- Hubbersty, Rev. Nathan...Wirksworth, Derbyshire
- Hubbersty, Philip...Wirksworth, Derbyshire
- Huckvale, T...Over Norton, Chipping Norton, Oxon
- Huddleston, Peter...Little Haugh, Norton, near Ixworth, Suffolk
- Huddleston, Thomas...Stedcombe House, Colliton, Devonshire
- Hudleston, Andrew Fleming...Hatten John, near Penrith, Cumberland
- Hudson, C. S...Wick, near Pershore, Worcestershire
- Hudson, George, M.P...York
- Hudson, G. B...Wick, near Pershore, Worcestershire
- Hudson, Rev. G. T...Saffrey, Wells, Dioc. of Exeter
- Hudson, Henry, jun...Wick, near Pershore, Worc.
- Hudson, John...Castlere Lodge, Swaffham, Norf.
- Hudson, Thos...Cheswardine Hall, Market Drayton, Salop
- Hudson, Thomas...Pendell, Betchingly, Surrey
- Huggup, James...Shieldyke, near Alnwick
- Hughes, B., M.P...13, King Street, St. James's
- Hughes, J...Donnington Priory, Newbury, Berks.
- Hughes, John...Phennant, near Wrexham
- Hughes, John...Laura Place, Aberystwith, S. W.
- Hughes, Lewis...Rhydyrwnen, Brecon
- Hughes, Thomas...Oswestry, Salop
- Hughes, William...Framfield, Uckfield, Sussex
- Hughes, W. Gamons...Glencochy, near Carmarthen
- Hull, Rich...Sutton Benger, Chippenham, Wiltsh.]
- Hulme, James Hilton...Manchester
- Hulme, Wm...Pembroke Bank, Pembroke, S. W.
- Hulson, Francis...Lyria, Norfolk

- Humbert, Charles F... Watford, Hertfordshire
 Humble, R... Renishaw, Chesterfield, Derbyshire
 Hume, John... Bean Regard, Jersey
 Humfrey, John... Upton, Wallingford, Berkshire
 Humfrey, William... Chaddlesworth, Newbury, Berkshire
 Humphreys, A. L. Woodlands, Shrewsbury, Salop
 Humphreys, E. Walcot, near Montgomery
 Humphreys, John... Evenhall, Oswestry, Salop
 Humphreys, John... Warwick Road, Upper Clapton, Middlesex
 Humphreys, John... Berriew Rectory, Welshpool, Montgomeryshire
 Humphries, J... Craumere, near Bridgnorth, Salop
 Humphris, James... Cowley, Cheltenham, Glosch.
 Humloke, Sir H., Bart... Wingeworth Hall, Chesterfield, Derbyshire
 Hunt, G. B... Bowden Hall, near Gloucester
 Hunt, George... Southampton
 +Hunt, G... The Grange, Broughton, Preston, Lanc.
 Hunt, James... 10, Whitehall
 Hunt, J... Thornington, near Wooler, Northumb.
 Hunt, John... Shirley, Southampton
 Hunt, Robert, jun... Stamford, Lincolnshire
 Hunt, William... Stamford, Lincolnshire
 Hunt, William... Dilston, Hexham
 Hunt, William... Leicester
 Hunt, W. O... Coomb Wood Lodge, Kingston, Surr.
 Hunt, Zachary D... Aylesbury, Buckinghamshire
 Hunter, Charles Vickers... Kilbourne, near Derby
 Hunter, Henry L... Beech Hill, Reading, Berkshire
 Hunter, John... Brandon Hall, Derbyshire
 Hunter, John... Chichester, Sussex
 Huxley, Rich... Gaden House, Uffington, Clampton, Devonshire
 Hurstone, William... Heathcote, near Warwick
 Hurrell, Reymes... Brandon Hall, Sudbury, Suffolk
 Hurry, John... Knarsfen, Thorney, Ely, Cambs.
 Hurt, Francis... Alderwasley, Belper, Derbyshire
 Hurt, Francis, jun... Duffield, near Derby
 Hurt, Richard... Wirksworth, near Derby
 Hurst, Robert, jun... Horsham, Sussex
 Hurwood, George... Ipswich, Suffolk
 Hussey, Ed... Scotney Castle, Lamberhurst, Kent
 Hussey, Rich. T... Waybrook, Alington, Exeter
 Hussey, T... Hambleden, Henley-on-Thames, Oxon
 Hutchinson, John... Monyruy, Peterhead, N. B.
 Huxley, Jonathan... Baiscolne, Halstead, Essex
 Huxley, William... Witham, Essex
 Hunt, John... Water Eaton, near Oxford
 Hunt, William... Thripp, Woodstock, Oxon
 Hutton, J... Sowder Hill, Northallerton, Yorkshire
 Hutton, T... Upton Gray, near Odham, Hampshire
 Hutton, W... Gate Burton, Gainsborough, Lincolnsh.
 Huxtable, Rev. Anthony... Station Waldron, Shaftesbury, Dorsetshire
 Hyder, Wm... Court Lees, Whitstable, Kent
 Icke, William... Woolley Breewood, Wolverhampton, Staffs.
 Ide, John... West Wittering, Chichester, Sussex
 Ill, Benjamin... Barbadoes, West Indies
 Ill, William... Barbadoes, West Indies
 Ilbert, William R... Horswell House, Kingsbridge, Devon.
 +iles, F... Barnoldby-le-Beck, Grimsby, Lincolnsh.
 Inett, Jas. A... Bryanston, Blandford Forum, Dorset.
 Inett, Wm... Barnby Moor, East Retford, Notts.
 Ingall, W. C... Swineshead, Boston, Lincolnshire
 Inge, Captain... Thorpe, near Tanworth, Staffs.
 Ingestre, Viscount, M.P... Ingestre, near Stafford
 Ingle, Thomas... Belper, Derbyshire
 Ingram, George... Chetwynd, Newport, Salop.
 Ingram, Hugh... Steyning, Sussex
 Ingram, Hugo F. M... Hodnes, Rugeley, Staffs.
 +Ingram, Rev. James... Trinity College, Oxford
 +Ingram, John Andrew... Codford St. Peter, Warminster, Wilts.
 Instone, Thomas... Calington, Wenlock, Salop.
 +Ireland, I. Ireland C... Brislington, near Bristol
 Ireland, Philip... Muckleton, near Shrewsbury
 Isaacson, John... Clare, Suffolk
 Isaacson, Wm. Farr... Newmarket, Cambridgeshire
 Ivatt, James... Cottenham, Cambridgeshire
 Ivatt, Robert... Cottenham, Cambridgeshire
 Iveson, John... Halliford, Chertsey, Surrey
 Jackson, Daniel... Boston, Lincolnshire
 Jackson, Geo. V... Caramore, Ballina, Ireland
 Jackson, H... Wisbeach, Isle of Ely, Cambridgeshire
 Jackson, John... East Haddon Grange, near Northampton
 Jackson, M... Bilsthorpe, near Southwell, Notts.
 Jackson, Samuel P... 12, Redcliffe Street, Bristol
 Jackson, Wm. R... Kimberton, Shifnal, Shropshire
 Jacob, Jacob... St. Cross, Winchester, Hants
 Jacob, James... Kingsland, Shrewsbury
 Jacobs, Wm. H... Chale Abbey, Newport, Isle of Wight
 Jacson, George... Barton Lodge, near Preston, Lanc.
 James, Chas... Bilborough Fields, near Nottingham
 James, Chas... Stratford, near Salisbury, Wiltshire
 James, Rev. Chas. Thos... Brentwood, Essex
 James, C. F... Kirknewton, near Wooler, Northumberland
 James, John... Wrington, Somersetshire
 James, Thomas... Brandon, Wooler, Northumb.
 +James, Captain W. E... Barrock Lodge, Chichester
 James, William P... Pantglass, Trelock, near Monmouth
 Jaques, R. M... Esby Abbey, Richmond, Yorkshir
 +Jarrett, John... Camerton House, Bath, Somerset.
 Jarvis, Edward K... Castle Hill House, Hineckley, Leicestershire
 Jarvis, Sir R... Fair Oak Park, Winchester, Hants
 Jebb, George... The Lyth, Ellesmere, Salop.
 Jebb, John... Stanwarden, Haschurch, Salop.
 Jefferson, Rev. J. D... Thicket Priory, Eacrick, near York
 Jeffery, John... College Green, Bristol
 Jeffery, Robert... Grover Farm, Huntspill, Bridgewater, Somersetshire
 Jeffery, William... College Green, Bristol

- Jefferys, N. N. . . . Milbrook, Southampton, Hants
 Jefferys, Samuel . . . Well Hall, Eltham, Kent
 Jeffs, Wm. . . . Costow House, Marston St. Lawrence,
 Northamptonshire
 Jelfs, Thomas . . . Hungerford, Berkshire
 Jemmett, Henry . . . Burford, Oxfordshire
 Jenaway, J., jun. . . . Clifton-upon-Dunsmore, Rugby,
 Warwickshire
 Jenkins, G. John . . . Pantition, near Cardigan, S. W.
 Jenkins, James . . . Chepstow, Monmouthshire
 Jenkins, John . . . St. Y-nyll, Cardiff, Glamorganshire
 †Jenkins, John, jun. . . . Caerleon, Monmouthshire
 Jenkins, Richard David . . . Mayor of Cardigan
 Jenkins, Thomas . . . Spetchley, Worcester
 Jenkinson, Joseph . . . Millwich, Stone, Staffs.
 Jenner, Montagu Herbert . . . Chislehurst, Kent
 Jenner, Robt. Fras . . . Wenvoe Castle, Cardiff, S. W.
 Jenner, Thos . . . Cowdray Park, Petworth, Sussex
 Jennings, David . . . Snaresbrook, Wanstead, Essex
 Jennings, J. C. . . . Evershot, Dorchester, Dorsetshire
 Jennings, Robt. F. . . . Little Belshanger, Deal, Kent
 Jenyns, Geo . . . Bottisham Hall, Cambridge
 Jepson, John . . . Rowthorne, Mansfield, Derbysh.
 Jepson, William . . . Heighington, Lincoln
 Jepson, Wm. . . . Edensor Inn, Bakewell, Derbysh.
 Jermy, Earl, M.P. . . . Bury St. Edmunds
 Jersey, Earl of . . . Middleton Park, Bicester, Oxon
 Jervoise, Samuel Clarke . . . Porter's Shenley, Barnet,
 Hertfordshire
 Jesson, Rev. Cornelius . . . Enville Rectory, West
 Stourbridge, Worcestershire
 Jessop, Joseph . . . Grove Farm, Chiswick, Middlesex
 Jessop, Michael . . . Alfreton, Derbyshire
 Jessop, Wm. . . . Butterley Hall, Alfreton, Derbyshire
 Jessopp, Francis . . . Derby
 Jeston, Thomas . . . Henley-on-Thames, Oxon
 Jesty, C. . . . Holywell, Evershot, Dorchester, Dorset.
 Jesty, Thomas . . . Druce Farm, Piddlet, Dorset.
 Jex, William . . . Hopton, Gt. Yarmouth, Norfolk
 Jeyes, John William . . . Uppingham
 Jobling, J. C. . . . Newton Hall, Newcastle-on-Tyne
 Jobson, R. . . . Turrelows, Wooler, Northumberland
 Jobson, Thomas . . . Bank Farm, Shrewsbury
 Jobson, William . . . Chillingham Newton, Wooler,
 Northumberland
 Jodrell, Sir Rd. Paul, Bart. . . . Sall Park, Reepham,
 Norfolk
 Johnson, A. . . . Hatfield, near Chelmsford, Essex
 Johnson, C. Wm. . . . Wallingtons, Newbury, Berks.
 Johnson, Francis D. . . . Aykley Heads, Durham
 †Johnson, George . . . Balaco Hill, Retford, Notts.
 Johnson, Henry . . . Burwell, Cambridgeshire
 †Johnson, Rev. H. Lutman . . . Binderton House,
 Chichester, Sussex
 Johnson, John . . . Hutton Garden, Liverpool
 Johnson, John . . . Holbeach, Lincolnshire
 Johnson, John G. . . . Bentley, near Ashbourne, Der-
 byshire
 Johnson, Joseph . . . Ravenswood, Dunsbury, Man-
 chester, Lancashire
 Johnson, Rev. N. P. . . . Aston-on-Trent, near Derby
 Johnson, Robt. . . . Burwell, Cambridgeshire
 Johnson, Rt. Jun. . . . Duke St., Edge Hill, Liverpool
 Johnson, S. . . . Somersall Hall, Chesterfield, Derbysh.
 Johnson, Thophilus F. . . . Spalding, Lincolnshire
 Johnson, Thomas . . . Cheapside, Leicester
 †Johnson, Thomas . . . Whittlesey, Cambridgeshire
 Johnson, Walter . . . East Field, Alnwick
 Johnson, William . . . Chesterton, Cambridgeshire
 Johnson, William . . . St. Helen's, Prescott, Lancashire
 Johnston, Charles . . . Claramount, Cheshunt, Herts.
 Johnston, John A. . . . Crondall, Farnham, Surrey
 Johnstone, George . . . 33, Tavistock Square
 †Johnstone, Rev. George . . . Broughton, Hunts
 Johnstone, Henry J. . . . Speen, Newbury, Berkshire
 Jolleff, Robert . . . Long Ashton, near Bristol
 †Jolliffe, Col. J. T. . . . Amnerdown Park, near Bath
 Jolliffe, Sir Wm. G. H., Bart. . . . Heath House, Peters-
 field, Hants
 Joly, Frederick . . . 51, Threadneedle Street
 Jonas, Samuel . . . Ickleton, Saffron Walden, Essex
 Jonas, Wm. Knapp . . . Bishop's Waltham, Hants
 Jones, Anthony Gilbert . . . Gloucester
 Jones, Benjamin H. . . . Lark Hill, Liverpool
 Jones, Brooke . . . Faversham, Kent
 Jones, Dr. W. D. . . . Lanchych, Newcastle Emlyn
 Jones, Edward . . . 19, College Green, Bristol
 Jones, Edward . . . 1, Church Court, Clement's Lane,
 Lombard Street
 Jones, Edward . . . Lanarth Court, near Monmouth
 Jones, Edw. . . . Velindre, Llandovery, Carmarthenash.
 Jones, George . . . Portswood House, Southampton
 Jones, George . . . Stanton, near Warwick
 Jones, Henry . . . Abbotswood, Gloucester
 Jones, Henry J. . . . Brockworth, Gloucester
 Jones, Rev. John . . . Penylan, near Cardigan, S. W.
 Jones, John . . . Harrington, Spilsby, Lincolnshire
 Jones, John . . . Glanholler, near Brecon
 Jones, John . . . 14, Benson Street, Liverpool
 Jones, John . . . Compton Marsh, Faringdon, Berks.
 Jones, John Edw. . . . Baysham, Ross, Herefordshire
 Jones, J. H. W. . . . Chastleton, Chipping Norton,
 Oxon
 Jones, John Price . . . Bitterley, Ludlow, Salop
 Jones, J. O. . . . Park Llwydiarth Can Ofice, Mont-
 gomeryshire
 Jones, J. R. . . . Brithdir Hall, Welsh Pool
 Jones, Matthew E. . . . Wilby, Wellingborough, North-
 amptonshire
 Jones, Matthew Edw. . . . Crankwell, Montgomery
 Jones, Philip . . . Llanarth Court, near Monmouth
 Jones, Philip . . . Chewton-Keynham, near Bristol
 Jones, Richard H. . . . Rodney Street, Liverpool
 Jones, R. P. . . . The Hermitage, Whitchurch, Salop
 Jones, Thos . . . Wern Mostyn, Holywell, Flintshire
 Jones, Thos . . . Kensworth, Market Street, Herts.
 Jones, Thos . . . Bentry, Westbury, Bristol
 Jones, Wm. . . . Pyle, Bridgend, Glamorganshire
 Jones, Wm. . . . Belle Vue, Brecknockshire
 †Jones, Wm. . . . Harrington, Shifnal, Shropshire
 Jones, Wm. . . . Sheep House, near Gloucester
 Jones, Wm. . . . The Park, Cardiff, Glamorganshire
 Jones, Wm. . . . Record Street, Ruthin, Denbighshire
 Jones, Wm. . . . Stone Hill, Liverpool
 †Jones, Wm. Beuce . . . Aghalashy, Bandon, Cork,
 Ireland

Jones, Wm. T...Gwynfryn, near Aberystwith
 Jordan, G. B. J....Figeonsford, Newcastle Emlyn,
 S. Wales
 Jordan, Wm....Cheltenham, Gloucestershire
 Josselyn, John....Sproughton, Ipswich, Suffolk
 Jowett, Rev. J. F....Kingston Bagpuze, Abingdon,
 Berks.
 Joyner, Henry St. John...Romford, Essex
 Jukes, Richard....Cotwall, Wellington, Shropshire
 Jukes, Thos....Tearn Farm, Wellington, Shropshire
 Jukes, Thos., jun....Beighterton, Shifnal, Shrop-
 shire
 Julian, John....Bury, Ramsey, Hants
 Jupp, John....Bromershill, Pulborough, Arundel,
 Sussex
 †Justice, Henry....Hinstock, Market Drayton, Salop
 Justice, Rev. J....Ightfield, Whitchurch, Shropshire

 Kaye, John....Oatlands, Timperley, Altrincham,
 Cheshire
 Kearsley, James....Tarleton, Lancashire
 Keary, H. W....Longlands, Holkham, Norfolk
 Keeling, Chas....Congreve, Penkridge, Staffs.
 Keen, Jas....Weston Park, Campden, Gloucestershire
 Keep, Adam C....Woollaston, Wellingborough
 Keer, J. J....Wantlands Hall, Woodbridge, Suffolk
 Kekewick, S. T....Peamore, near Exeter
 Kelham, R. K....Bleasby, Southwell, Notts.
 Kelsey, Fred. J....West Lavington House, Wiltshire
 †Kemble, Horatio....Leggatts, near Hatfield, Herts.
 †Kemble, Thos....Leggatts, near Hatfield, Herts.
 Kemp, James C....Liverpool
 Kemp, Jesse....Utterby Grove, Louth, Lincolnshire
 Kemp, Wm....Thrawley, Faversham, Kent
 Kemp, Wm....Gt. Tey, Colchester, Essex
 Kempson, J....Birchfields, Bromyard, Herefordsh.
 Kendall, N....Pelyn, near Lostwithiel, Cornwall
 Kendall, S....East Moulsey, near Kingston, Surrey
 Kendle, C. J....Fordham, Downham Market, Norfolk
 Kendle, James....Weasenham, Rougham, Norfolk
 †Kennaway, Sir John, Bart....Escot, Honiton, Devon
 Kennet, Rich....Lagenhoe Wick, Colchester, Essex
 Kennington, T....Stainton Vale, Binbrook, Market
 Rasen, Lincolnshire
 Kent, John....Stratford, Essex
 Kent, John....Bristol
 Kenward, J. W....Metching, near Uckfield, Sussex
 Kenyon, Hon. Thomas....Pradoc, Oswestry
 Keppel, Hon. and Rev. Thomas....Wells, Norfolk
 Kerl, Wm....Annables Farm, Kinsborne Green,
 Harpenden, Herts.
 †Kerrich, John....Geldiston Hall, Beccles, Norfolk
 Kerrison, E. C....13, Stanhope Street, Mayfair
 †Kesterton, T....Woodlands, Leatherhead, Surrey
 Kett, Geo. S....Brook House, Norwich, Norfolk
 Keyworth, Joseph....Spital, Lincolnshire
 Keyworth, Thomas M....Lincoln
 Kilby, George....Queeniborough, Leicestershire
 Killick, Henry....Liverpool
 Kimber, Thos....Fyfield Wick, Abingdon, Berks.
 Kimberley, Geo....Virginia Cottage, Egham, Surrey
 †Kinder, J....Sandridge Bury, St. Albans, Herts.
 Kinder, T....Sandridge Bury, St. Albans, Herts.

†King, Chas....Little Brinton, Northamptonshire
 King, Benj....Shotley, Ipswich, Suffolk
 King, E. B....Umberslade, Henley-in-Arden, War-
 wickshire
 King, F....Oxford
 †King, Fielder....Buriton, Petersfield, Hampshire
 King, Frederick....Nursling, Southampton
 King, James....Dullingham, Cambridge
 King, Rev. J....Longfield Court, Dartford, Kent
 King, James K....Staunton Park, near Leominster,
 Herefordshire
 King, John....Kelby, Sleaford, Lincolnshire
 King, John....The Grove, Exton, Alton, Hants
 King, John....Ashampstead, near Reading, Berks
 King, Rev. J. M....Cutcombe Vicarage, Dunster,
 Somersetshire
 King, John W....Chilton Polden, near Bridgewater
 King, Hon. P. J. L....Woburn Park, Chertsey, Surrey
 King, Colonel Richard....Hythe, Kent
 King, Rich....Stoneham, Southampton, Hants
 King, R. K. M....Walford, near Taunton, Somerset
 King, Richard Poole....Bristol
 King, Robert....Wytham, near Oxford
 King, R. M....Pyrland Hall, Taunton, Somersetshire
 King, R. W....Brinkley Hall, Newmarket, Camb.
 King, F....Stourton Mere, Wiltshire
 King, Wm. P....Brislington, Bristol
 Kingdon, Rev. S. N....Bridgerule Vicarage, near
 Holsworthy, Devon.
 †Kingscote, T....Kingscote, Tetbury, Gloucestersh.
 Kingsford, John....Esher, Surrey
 †Kingsmill, Wm....Sydmonton Park, Newbury,
 Berkshire
 Kingsnorth, A....Ashinden House, Tenterden, Kent
 Kingston, Thos....Charlton House, Wrexham, Bristol
 Kinlock, John....Logie, Kirtlemuir, N. B.
 Kinsey, G....Cornbury Park Farm, Witney, Oxon.
 Kirkland, Sir John....East Horseley Park, Leather-
 head, Surrey
 Kirkpatrick, Wm....Delves House, Ringmer, Lewes
 Kirman, T....Walesby, Market Rasen, Lincolnshire
 Kirsopp, Jas....The Spittal, Hexham, Northumb.
 Kirwan, D....Castle Hacket, Tuam, Co. Galway
 Kitson, Rev. Robt. C....Dean Vicarage, Dean Prior,
 near Ashburton, Devon.
 Kittow, T....Linkinghorne, near Liskeard, Cornwall
 Knatchbull, Rev. W....Cholderton Lodge, Ames-
 bury, Wilts.
 †Knatchbull, Wm....Babington, Frome, Somerset
 Kneshaw, W....Bury St. Edmunds, Suffolk
 Knight, C. A....Simondsbad, South Molton, Devon.
 Knight, E....Godmersham Park, Canterbury, Kent
 Knight, E., jun....Chawton House, Alton, Hants
 Knight, H....Llwynderew, near Swansea, Glamorg.
 Knight, H....St. John's Place, Winchester, Hants
 †Knight, H. Gally, M.P....Firbeck Hall, Bawtry,
 Yorkshire
 Knight, James....Gt. Hadham, Ware, Hertfordshire
 Knight, James....Southampton
 Knight, John B....West Lodge, Dorchester, Dorset.
 Knight, John H....High Street, Southampton
 Knight, Richard....Dunton Hall, Brentwood, Essex
 Knight, Thomas....Nozington, near Lewes

- Knight, Robt...St. John's Place, Winchester, Hants
 Knight, Rev. Robt....Tythegston Court, Bridgend, Glamorganshire
 Knight, Thos...Bobbing Court, Sittingbourne, Kent
 Knight, Thos...Edmonton, Middlesex
 Knightley, Sir Charles, Bart., M.P....Fawsley Park, Daventry, Northamptonshire
 †Knighton, Sir William, Bart...Blendworth Lodge, Hordean, Hants
 Knollis, J. E...Simbly, Langford, Brandon, Norfolk
 Knollys, Colonel...Blount's Court, Henley, Oxon
 Knowles, John...Easton, Newbury, Berkshire
 Knowles, Joshua...Stormer Hill, Tollington, near Bury, Manchester
 Knowles, Joshua...Attercliffe, near Sheffield
 Kough, Thos. Harley...Shrewsbury
 Kynaston, Cabot...Caldy Island, Tenby
 Kynaston, Sir Roger, Bart....Hardwick, near Ellesmere
 Kynnersley, T. C. Sneyd...Loxley Park, Uttoxeter, Staffs.
- Laborne, Daniel...Eske, Beverley, Yorkshire
 Lacey, W...Panton, Wragby, Lincolnshire
 Lacey, Wm...Adboulton House, Nottingham
 Lacon, Sir Edmund H. K., Bart...Somerton Hall, Great Yarmouth, Norfolk
 Lacom, John E...Ormesby House, Great Yarmouth
 La Coste, Thos. B...Abbey Mills, Chertsey, Surrey
 Ladbroke, Felix...Hedley, Epsom, Surrey
 Laddis, James...Deanslanger, near Stony Stratford, Bucks.
 Ladds, Wm...Ellington, near Huntingdon
 Laing, John...Maddown Cornhill, near Coldspring, Durham
 Lake, Robert...Milton, near Canterbury, Kent
 Lakin, Edwd...Beauchamp Court, near Worcester
 Lakin, Henry...Severn End, near Worcester
 Lamb, John...Liverpool, Lancashire
 Lamb, Rev. John...Dean of Bristol, Corpus College, Cambridge
 †Lamb, William...Hay Car, Ellet, Lancaster
 Lamb, Wm...Cranwell Grange, near Sleaford, Linc.
 Lamb, Wm...Fair Mile, near Henley-on-Thames, Oxon
 Lambard, Wm...Beechmont, Seven Oaks, Kent
 Lambe, Wm...Auborn, near Lincoln
 Lambert, John James...Dorchester, Dorsetshire
 Lambert, Wm. Chas...Knowle House, Wimborne, Dorsetshire
 Lance, Edwd. J...Blackwater, Bagshot, Surrey
 Lance, Rev. John E...Cliffe, Blandford, Dorsetsh.
 †Landon, H. Eyres...Warwick
 Lander, Thomas...Burton-on-Trent, Staffordshire
 Lane, John...Lundinaho, Ross, Herefordshire
 Lane, John...Barton Mill, Cirencester, Gloucester
 Langdale, Hon. Charles...Houghton Hall, Market Weighton, Yorkshire
 Langdale, Marmaduke R...Garston House, Godstone, Surrey
 Langford, G...Henfion, Llandysall, Montgomery
 Langham, Herbert...Cottesbrooke, Northampton.
 Langhorne, O...Mill Hills, Hexham, Northumb.
- Langlands, John Chas...Bewick, near Alnwick
 Langley, Henry...2nd Life Guards
 Langton, Henry Gore...5, Lower Crescent, Clifton, Bristol
 Langwith, Joseph Silveston...Grantham, Linc.
 Langworthy, Austen...Longwood House, Bristol
 Lankester, Joseph...Southampton
 Lankester, William...Southampton
 Lansdale, R., jun...Worsley Hall, Manchester
 Lanwarne, Nicholas...St. John Street, Hereford
 Large, Charles...Broadwell, Lechlade, Gloucester.
 Large, John...Kencot, Lechlade, Gloucestershire
 Largeat, J. H...Wickham Market, Suffolk
 Laratt, Daniel...Thurby, near Bourn, Linc.
 Lasham, R. S...Woodlands, Westmoor, near Petersfield, Hants
 Latham, R. Cousins...Clifton Hampden, near Abingdon, Berkshire
 Latimer, Thomas...Exeter, Devonshire
 La Touche, David...Marley, Dublin
 Lattermore, Chas. Higby...Bride Hall, Wheathampstead, St. Albans, Herts.
 Laufear, Thomas...Avington, Hungerford, Berks.
 Lawrence, James...Toxteth Park, near Liverpool
 Lavington, Samuel...Devizes, Wiltshire
 †Law, Rev. R. V...Christian Malford, Chippenham, Wiltshire
 Law, John...Uppingham, Rutlandshire
 Lawford, Edward...Leighton Buzzard, Bedfordsh.
 Lawford, J...Mount Pleasant, Tottenham, Middlesex.
 †Lawford, Thomas, jun...Tirydall, near Llandilo, Carmarthenshire
 Lawford, Wm. R...Leighton Buzzard, Bedfordsh.
 Lawrance, Joseph...Tilly Grange, Dunmow, Essex
 Lawrance, T. M...Dunsby Hall, Folkingham, Linc.
 Lawrance, Wm...Peterborough, Northamptonsh.
 Lawrence, Charles...Cirencester, Gloucestershire
 Lawrence, George...Cowsfield, Salisbury, Wilts.
 Lawrence, Henry, jun...Ely, Cambridgeshire
 Lawrence, Captain I. R...East Harptree, Wells, Somersetshire
 Lawrence, Northmore...Launceston, Cornwall
 Lawrence, R...Betterton, Wantage, Berkshire
 Lawrence, Richard C...Leeshill, Uttoxeter, Staffs.
 Lawrence, Wm. E...The Greenway, Cheltenham
 Lawrence, Wm. Scott...Stapleton, near Bristol
 Lawson, Andrew, M.P...The Hall, Boroughbridge, Yorkshire
 †Lawson, C...George the Fourth's Bridge, Edinbro.
 Lawson, Robt...Everley Lodge, East Barnet, Herts.
 Lawson, William...Longhist Hall, Morpeth
 Lawton, J. B...Newark, Nottinghamshire
 Lax, George...Wells, Somersetshire
 Lax, J., jun...East Horsington, Wells, Somersetsh.
 Lax, Robt...West Horsington, Wells, Somersetsh.
 Lax, Thomas...Wells, Somersetshire
 Laxton, J...Thorney, Peterborough, Northampt.
 Laxton, R. W...Morbone, Stilton, Huntingdonsh.
 Laxton, Wm...Wragg Marsh, Spalding, Lincolnsh.
 Lay, John G...Great Tey, Colchester, Essex
 Layburn, J...Wold Cottage, Bridlington, Yorksh.
 Laycock, Joseph...Lantz Hall, Newcastle-on-Tyne
 Laycock, Rich...Wenlton, near Newcastle-on-Tyne

- Laycock, Robt. . . . Wenlaton, near Newcastle-on-Tyne
 Layton, Robt. M. . . . Thorney Abbey, Peterborough,
 Northamptonshire
 Layton, William Woodhouse, Ely, Cambridgesh.
 Lea, John Ellesmere, Salop
 Leach, Rev. Fras. George St. Petrix, Pembroke-sh.
 Leach, Fras. Edward Gilybehill, Neath, S. W.
 Leach, Frederick Grove Mill, Watford, Herts.
 Leach, George Stoke Devonport, Devonshire
 Leach, Henry Corston, near Pembroke
 Leadbeater, John B. . . . Brentingly, Melton Mowbray,
 Leicestershire
 Leake, Lieut.-Col. Robert Martin Woodhurst,
 Oxted, near Godstone, Surrey
 Le Blanc, Arthur Marrafield, Uckfield, Sussex
 Ledger, R. . . . Knotty Ash, near Liverpool
 Leidiard, Thomas Cirencester, Gloucestershire
 Lee, Charles Ellington Masham, Bedale, Yorksh.
 Lee, Hen. T. . . . Dinaspowis, Cardiff, Glamorgansh.
 Lee, James Noah 1, Little Charlotte Street, Black-
 friars Road
 Lee, Joseph Dilston, Hexham, Northumberland
 Lee, Joseph, jun Red Brook, Whitechurch, Salop
 †Lee, J. L. . . . Dillington House, Ilminster, Somerset.
 Lee, Peter Winchester, Hampshire
 Lee, Thos Barkstone, near Grantham, Lincolnsh.
 Leech, John Wall Hill, Leek, Staffordshire
 Leedham, William Westbury Hill, near Bristol
 Leeds, E. Thurlow Eyeberry House, Eye, Peter-
 borough, Northamptonshire
 Leeds, Henry Stillington, Huntingdonshire
 Leeds, Robt. Martin Addiscombe, Croydon, Surr.
 Leeks, Rev. R. H. . . . Rackley Grange, Shifnal, Salop
 Leeks, Ralph Longford Hall, Newport, Salop
 Lees, George Wyld 47, Fleet Street, London
 Lees, William Bakewell, Derbyshire
 Leese, Benjamin Eastling, Faversham, Kent
 Lefevre, John G. Shaw Board of Trade, Whitehall
 Lefroy, C. E. . . . Ewashot House, Farnham, Surrey
 Legard, George Fangfoss, Pocklington, Yorkshire
 Leigh, G. C. . . . M.P. . . . High Leigh, Warrington, Lanc.
 Leigh, P. . . . Norbury Booth Hall, Knutsford, Cheshire
 Leigh, Samuel Ellesmere, Salop
 Leigh, Capel H. . . . Pontypool Park, Montgomerysh.
 Leigh, Herbert Donningford, near Hereford
 Leigh, James H. . . . Belmont, Northwich, Cheshire
 Leigh, Rev. John Egginton Rectory, near Derby
 Leighton, Sir B. Loton, Shrewsbury, Shropsh.
 †Leitz, the Rev. W. M. Ditchet, Castle Carey,
 Somersetshire
 †Leith, Alexander Freefield and Glentindie, Aber-
 deenshire, N. B.
 Le Jeune, William Rickman Southampton
 Lemmon, C. . . . Colshall Farm, Shoddham, Norfolk
 †Lempriere, Capt. G. O. Pelham Place, Alton,
 Hampshire
 Leonard, Patrick Soho Street, Liverpool
 Leonard, Thomas Broxted Hall, Dunmow, Essex
 Leasher, Joseph Boyles, Brentwood, Essex
 Leslie, Chas. P. Glasslough, Ireland
 Lethbridge, A. G. Sandhill Park, Taunton, Somers-
 etshire
 Lethbridge, J. K. Tregeare, Launceston, Cornwall
 Leven and Melville, The Earl of Melville House,
 Fife, N. B.
 Levett, John Wicknor Park, Lichfield, Staffs.
 Lewellin, D. Tremons, Bridgend, Glamorganshire
 Lewer, Edward Wimborne, Dorsetshire
 Lewes, Rev. Thos Taynton, Burford, Oxon
 Lewis, A. M. Nether Wallop, Andover, Hants
 Lewis, David Stradey, Llanelly, near Carmarthen
 Lewis, Edward Hertingfordbury, near Hertford
 Lewis, Henry Green Meadow, Cardiff, Glamorg.
 Lewis, Henry Hendre, near Carmarthen
 Lewis, James Cardiff, Glamorganshire
 Lewis, L. Northington, near Alresford, Hants
 Lewis, R. Ash Farm, Stompain, Blandford, Dorset.
 Lewis, Robt. Bagley, Ellesmere, Salop
 Lewis, T. Norchard, near Pembroke, Pembroke-sh.
 Lewis, Wm. Groundslo Field, Stone, Staffs.
 Lewis, W. H. Clyntiew, Newcastle Emlyn, Car-
 marthenshire
 Ley, Rev. Henry Kenn, near Exeter
 Ley, John H., jun Irehill, near Exeter, Devon.
 Lichfield, Coventry H. Golder Farm, Tetsworth,
 Oxon
 Liddbetter, Richard Bramber, Steyning, Sussex
 Liddon, John W. Hemel Hempstead, Hertfordshire
 Lilford, Lord Lilford Hall, Oundle, Northampsh.
 Lilley, Fred. W. Grantchester, near Cambridge
 Lilley, James Basingbourn, near Royston, Herts.
 Lincoln, Earl of, M.P. Ranby Hall, Retford, Not-
 tinghamshire
 Lindley, Urban Radmanthwaite House, near
 Mansfield, Notts.
 Lindsell, Rev. E. Broom Hall, Biggleswade, Bed.
 Lindsell, R. Biggleswade, Bedfordshire
 Lindsell, Thos Hemingford, St. Ives, Hunts.
 Lines, Edwd. A. Hillsgden, near Buckingham
 Lingen, Henry 4, Essex Court, Temple, London
 Linn, Wm Broomhill Tile Works, near Felton,
 Northumberland
 Linnell, John Woodford, Thrapstone, North-
 amptonshire
 Linnell, Rich. Stowe, Weedon, Northamptonshire
 †Linton, Rev. Jas Hemingford, St. Ives, Hunts.
 Linton, Wm Westwick, Cambridgeshire
 Lipscomb, John Petersfield, Hampshire
 Lismore, Viscount Shambally Castle, Clogheen,
 Ireland
 Lister, Thomas Broseley, Shropshire
 Lister, William Dalton, Richmond, Yorkshire
 Lithgow, George Stanway, Colchester, Essex
 Little, Joseph Littleport, Ely, Cambridgeshire
 Little, R. D. Secretary to the Agricultural Society,
 Chippenham
 Little, Wm. H. Llanfair Grange, Abergavenny,
 Monmouthshire
 Littledale, Edward Rodney Street, Liverpool
 Littledale, Geo. H. Crick, Daventry, Northamp-
 tonshire
 Littledale, Harold Liscard, near Liverpool
 Littleale, Henry Cardington, near Bedford
 Littlewood, John Armthorpe, Doncaster, Yorksh.
 †Livesey, J. Scourton Hall, near Horncastle, Linc.
 Livett, John Eaton Socon, St. Neot's, Hants.

- †Llewellyn, Richard...Tregwynt, Fishguard, Pembrokeshire
- Llewellyn, Pearce...Merrian Court, near Pembroke
- Llewellyn, Wm...Greenfield, near Neath, Glamorg.
- Llewellyn, W....Courtcolman, Bridgend, Glamorg.
- Llewellyn, J. D....Pullengare, Swansea, Glamorgsh.
- Lloyd, Alfred...Broad Green, Croydon
- Lloyd, Bell...Cory-gedol, Barmouth, Merionethsh.
- Lloyd, Chas...Court Calmore, near Montgomery
- Lloyd, Cynnig...Pontiffith Mold, Flintshire
- Lloyd, Edw...Cefu, St. Asaph, Flintshire
- Lloyd, Edmund...Thornbury, Gloucestershire
- Lloyd, Geo. P...Plasyndd, Bala, Merionethshire
- Lloyd, J. A...Leaton Knolls, Shrewsbury, Shropsh.
- Lloyd, L. F...Mannerh Hall, Mold, Flintshire
- Lloyd, L...Pontiffith Hall, Mold, Flintshire
- Lloyd, Rev. Martin...Depden Rectory, Bury St. Edmunds, Suffolk
- Lloyd, Rev. Thos....Swyfield Rectory, North Walsingham, Norfolk
- Lloyd, Thos...Langley, Ludlow, Shropshire
- Lloyd, Hon. Thos. P....Pengwern, near St. Asaph, Flintshire
- Loader, Caleb...Gomaldon, Salisbury, Wiltshire
- Lock, Edward...Oxford
- Lock, George...Blandford, Dorsetshire
- Lock, Samuel...Barton, Stoke Ferry, Norfolk
- †Loft, William...Trusthorpe, Alford, Lincolnshire
- Logan, Geo....Home Farm, Blenheim Park, Woodstock, Oxon
- Lomax, John...Clayton Hall, Blackburn, Lancash.
- Long, Rev. C. M....Rector of Whitchurch, Salop
- Long, F. S...Bulford, Amesbury, Wiltshire
- Long, Geo...Berkeley, Gloucestershire
- Long, Henry L...Hampton Lodge, near Farnham, Surrey
- Long, John...Marwell Hall, Winchester
- Long, Robert...Overton, near Marlborough, Wilts.
- Long, Walter...Preshaw House, Bishop's Waltham, Hampshire
- Long, W. J....Preshaw House, Bishop's Waltham, Hampshire
- Long, William...Melbourn, Cambridgeshire
- Long, Wm...Hunt's Hall, Saxmundham, Suffolk
- Longbourne, John...Saundersfoot, Tenby, Pembrokeshire
- Longbourne, W. T....4, South Square, Gray's Inn
- Longcroft, C. R...Llanina, Aberystwyth, Cardigansh.
- †Longe, John...Spixworth Park, Norwich, Norfolk
- Longley, William...Camber Farm, Rye, Sussex
- Longworthy, Vincent T...Himinster, Somersetshire
- Longdon, Wm...Little Longstone, near Bakewell, Derbyshire
- Longstaff, Wm...Fisherton Hall, near Lincoln
- Loomes, Edward...Whittlesea, Cambridgeshire
- Lopes, Sir Ralph, Bart., M.P....Maristow House, near Plymouth, Devon.
- Lord, Christopher...Bridge Norton, Witney, Oxon.
- Lord, John...Standish Hall, Wigan
- Losecombe, C. W., jun...8, Prince's Buildings, Clifton, Bristol
- Lott, H. B...Tracy House, Honiton
- Load, George H...Beckland, Dover, Kent
- †Loud, H. F....Leybourne Castle, Town Malling, Maidstone, Kent
- Lovett, John...Gloucester
- Love, P....Manor House, Naseby, Welford, Northamptonshire
- Love, S...Castle Farm, Shoreham, Dartford, Kent
- Loveday, John...Williamsote, Banbury, Oxon
- Lovel, Rich...Edgecot Lodge, near Banbury
- †Lovell, Edwin...Dinder, Wells, Somersetshire
- Lovell, John...Teck, Duteate, Wells, Somersetshire
- †Lovell, Thomas, jun....West Haddon, Daventry, Northamptonshire
- Lovell, Wm. W....West Haddon, Daventry, Northamptonshire
- Lovett, Joseph V...Belmont, Oswestry
- Lovibond, J. L...Loadbridge, Langport, Somerset.
- Low, Joseph...Hill Hall, Gt. Bardfield, Braintree
- Lowe, Charles...Stamford, Lincolnshire
- Lowe, George...39, Finsbury Circus
- Lowe, John...Belminsthorpe, Stamford, Lincolnsh.
- Lowe, John...Birmingham
- Lowe, Peter...Marston, Stafford
- Lowe, Richard...Park Street, Bristol
- Lowe, William...Liverpool
- Lowe, Wm...The Lea, Cleobury Mortimer, Salop
- Lowndes, Richard Chas...Low Hill, Liverpool
- Lowndes, Wm. C...Brightwell, Tetworth, Oxon
- Lowrey, Thos...Syston, Grantham, Lincolnshire
- Lowrey, Wm....Barmoor, near Wooler, Northumb.
- Lowson, Newby...Witton-le-Wear, Bishop Auckland, Durham
- †Lubbock, Sir J. Wm., Bart...23, St. James's Place
- Lucan, Earl of...Laleham, Staines, Middlesex
- Lucas, Bernard M...Highfield, near Chesterfield
- Lucas, George...Newport Pagnell, Bucks.
- Lucas, Henry...Uplands, Swansea, Glamorganshire
- Lucas, Joseph...Rowsham, Aylesbury, Bucks.
- Lucas, Lieut. Richard...2nd Life Guards
- Lucas, Rev. W...Burgh, near Acle, Norfolk
- Luckham, L...Broadway, near Weymouth, Dorset.
- Lucy, Rev. J....Hampton Lucy, Stratford-on-Avon, Warwickshire
- Luddington, Wm...Littleport, Isle of Ely, Camb.
- Ludlow, H. G. G...Heywood House, Westbury, Wilts.
- Lugar, Edw...Hengrave, Bury St. Edmunds, Suffolk
- Lumbert, R. C...Burghfield Hill, Reading, Berks.
- Lungley, Brooke M...Peyton Hall, Boxford, Suffolk
- Lungley, Smyth...Kelvedon, Essex
- Lungley, Thos...Bures Hamlet, Sudbury, Suffolk
- Lunn, J. W....South Ferriby, Barton-on-Umber, Lincolnshire
- Lunn, Robt., jun...Norton, Evesham, Worcestersh.
- Lush, Joseph...Kilmington, Mere, Wilts.
- Lushington, Sir H., Bart...32, Montague Square
- Lushington, Rt. Hon. Stephen R....Merry Hill, Watford, Herts.
- Luttrell, Rev. Alexander...Minehead Vicarage, near Bridgewater, Somersetshire
- Luxmore, Rev. C. T. C....Gillsfield, Welch Pool, Montgomeryshire
- Lyne, Wm....Oddington, near Stow-on-the-Wolds, Gloucestershire
- Lynn, Robert...Stroxtan, Grantham, Lincolnshire

- Lynn, William...Waterloo Hotel, Ranelagh Street, Liverpool
 Lyon, Chas. W...Barton-under-Needwood, Burton-on-Trent, Staffs.
 Lyon, Captain Jas...Dangstane, Petersfield, Hants
 †Lyon, J. W...Miserdine Park, near Cirencester, Gloucestershire
 Lyon, Joseph...Neston, near Chester, Cheshire
 Lys, Stephen...Harlow, Essex
 Lysoght, Admiral Arthur...Bath
 Lysons, Rev. S...Hempstead Court, near Gloucester
 Lytton, Hon. and Rev. W. H...Kettering, Northampton
- Mabbett, John...Stinchcombe, Dursley, Gloucester.
 Mabbott, William Courtthorp...Lewes, Sussex
 MacConnel, H...Cressbrook, nr. Bakewell, Derbysh.
 MacCormick, William...Kirkdale, near Liverpool
 MacDonald, Alexander...9, Hyde Park Street
 MacDonald, The Rev. Douglas...West Alvington, Kingsbridge, Devonshire
 MacDonald, George...Ellesmere, Salop
 †MacDougall, A. H...44, Parliament Street
 †MacDowall, J. C. S...New Freugh, near Patrick's Plains, Upper Hunter, Sydney, N. S. W.
 MacFarlane, John...Speke, near Liverpool
 Machin, H...Gateford Hill, Worksop, Notts.
 Mackie, J...Bamborough Hall, Belford, Northumb.
 Mackie, Wm. Hay...Yscuriora, Oswestry, Salop
 Mackintosh, Robert James...West Stratton, Andover Road, Hampshire
 Mackrell, William...Collingbourne, Kingstone, Marlborough, Wiltshire
 †MacLaine, Col. Hector...Thornbury, Gloucestersh.
 †MacLeod, Norman...London
 †MacNeill, Forbes...44, Finsbury Circus
 †MacNiven, Charles...Perrysfield, Oxted, Surrey
 Macpherson, Donald...King's Lynn, Norfolk
 MacTaggart, J...Foxlease, near Lyndhurst, Hants.
 Madden, Dennis...Liverpool
 Maddison, T...Wandon, Wooler, Northumberland
 Maddy, Thomas Watkin...Sutton Court, Hereford
 Magenwis, J...Pool Quay, Shrewsbury, Shropshire
 Maher, J. H...Lynn, Norfolk
 Maine, Rev. J. T...Bighton Hall, Alresford, Hants.
 †Mainwaring, C. K...Oteley Park, Ellesmere, Salop
 †Mainwaring, Rev. J...Bromborough Hall, Chester
 †Mainwaring, Townshend, M.P...Marchviell Hall, Wrexham, Denbighshire
 Maitland, General Frederick...Hollywick, Hartfield, East Grinstead, Sussex
 Maitland, John G...Surrey Villa, Lambeth, Surrey
 Maitland, William Whitaker...Chigwell, Essex
 Majendie, Ashhurst...Hedingham Castle, Essex
 Major, Stephen...Stanhorn Green, near Hungerford, Berkshire
 Malins, L...Dan-y-gaig, Newton Nottage, Glamorg.
 Mallam, Thomas...Oxford
 Mallard, William...Bristol
 Malloch, C. H...Chelston House, Torquay, Devon.
 Mallow, George...Wattfield, Lxworth, Suffolk
 Malmesbury, The Earl of...Heron Court, Christchurch, Hants
- †Maltby, Edward Harvey...G 3, Albany
 Mammath, John...Ashby-de-la-Zouch, Leicestersh.
 Manclark, R. B...Warslow Hall, near Ashbourne, Derbyshire
 Mander, James...Castle Street, Liverpool
 †Mangles, F. M.P...Down Farm, Compton, Guildford, Surrey
 Manley, John Shawe...Manley Hall, Lichfield
 Mann, John...Fenstanton, Saint Ives, Hunts.
 Manners, Lord Charles, M.P...Belvoir Castle, near Grantham, Lincolnshire
 Manning, Augustus...8, Hertford Street, May Fair
 Manning, C. J...Cranford Bridge, Middlesex
 Manning, Fred...Langley House, Abbots Langley, Hertfordshire
 Manning, Henry...251, High Holborn
 Manning, John...Harpole, near Northampton
 Manning, John L...Bardon Park, near Leicester
 Manning, William...Elstow, near Bedford
 Mannings, George...Downton, Salisbury, Wiltshire
 Mansel, Raleigh A...Heathfield, Swansea, Glamorg.
 Mansel, Thomas...Pembroke
 Mansell, Sir John, Bart...Llanstephen Cottage, near Carmarthen
 Mansell, Thomas...Adcott Hall, near Shrewsbury
 Mansfield, The Earl of...Scone Palace, Perth
 Maples, Thomas...Spalding, Lincolnshire
 †March, The Earl of, M.P...Chichester, Sussex
 Marchant, George...Titsey Court, Godstone, Surrey
 Marden, William, jun...Gerpens, Rainham, Essex
 Marfen, W...Norton Cannock, Penkridge, Staffs.
 Markeet, John...Mattingley Farm, Easton, Hants.
 †Margetts, Charles...Huntingdon
 Marindin, Rev. Sam...Shanks House, Wincanton, Somersetshire
 Marjoribanks, D. C...Bushey Hall Farm, Watford
 †Marjoribanks, Edward, jun.
 Marjoribanks, Stewart, M.P...Bushy Grove, near Watford, Hertfordshire
 †Markham, Charles, jun...Northampton
 Marklove, Chas...Oil Mills, Berkeley, Gloucestersh.
 Marlborough, Duke of...Blenheim Place, Woodstock, Oxon
 Marmont, James...Bristol
 Marple, R...South Wingfield, Alfreton, Derbyshire
 Marriot, Hayes...Saddington, Market Harborough, Leicestershire
 Marriot, John...Liverpool
 Marsh, Isaac...Beedy, near Elmham, by Dereham, Norfolk
 Marsh, John...Norton Farm, Stone, Staffordshire
 Marsh, John...Lydgate Hall, near Sheffield, Yorksh.
 Marsh, John Riley...Weston Coney Hall, near Longton, Staffordshire
 Marshall, Buchanan...Islington, Liverpool
 Marshall, Francis...Grimstone Cottage, Wolverhampton, Staffordshire
 Marshall, F...Grimstone Cottage, Wolverhampton
 Marshall, George...Godalming, Surrey
 †Marshall, James Garth...Headingley, near Leeds
 Marshall, John...Latimers, Chesham, Bucks.
 Marshall, John...Eken Lodge, Beekenhams, Kent
 Marshall, John...Alnham, Whittingham, Alnwick

- Marshall, John...Riseholme Lodge, near Lincoln
 Marshall, Jos...Waldersa House, Wisbeach, Camb.
 Marshall, Rev. T...Eccleston, near Chorley, Lanc.
 Marshall, Thos. G....Harvington Lodge, Evesham, Worcestershire
 Marshall, Thomas John...Mill Hill, near Derby
 †Marshall, Wm., M.P....Patterdale Hall, Carlisle, Cumberland
 Marshall, William...Hustlerpoint, Brighton, Sussex
 Marsham, Charles W....Stratton Strawless, near Norwich, Norfolk
 Marsham, Rob. (D. C. L.)...Merton College, Oxon
 Marsham, Rob....Stratton Strawless, near Norwich, Norfolk
 Marsland, Henry...Stockport, Cheshire
 Marsland, Major Thos...Henbury Hall, Macclesfield
 Marsom, Thomas Fred...11, Cumberland Terrace, Regent's Park
 Marston, F...Affect, near Shrewsbury, Shropshire
 Martin, Chas. Wykeham, M.P....Leeds Castle, Maidstone, Kent
 Martin, David...Wainfleet, Spilsby, Lincolnshire
 Martin, E. W....Burchwood House, Croydon, Surrey
 †Martin, Fran. P. B....Kingston House, Dorchester, Dorset
 Martin, F...Shepton-Montague, Bruton, Somerset
 Martin, Henry...Littleport, Ely, Cambridgeshire
 Martin, H. B....Colston Besset, Bingham, Notts.
 Martin, John...Evershot, Dorset
 Martin, John...Bury, Huntingdonshire
 Martin, P. S. F...Halstead, Essex
 Martin, Robert...Asterby, Horncastle, Lincolnshire
 Martin, Thomas...Hextle House, East Peckham, Tonbridge, Kent
 Martin, W. B...Westborough, Barnsley, Yorkshire
 Martinson, Ed...Hedgesfield, Newcastle-on-Tyne
 Marton, G., M.P....Capernwray Hall, near Lancaster
 Maskelyne, A. M. S...Glanusk, Serrybridge, Brecon
 †Mason, C. A...Farrington, Ledbury, Herefordshire
 Mason, E...Hall Farm, Waterbeach, Cambridgeshire
 Mason, Henry...Branston, Burton-on-Trent, Staffs.
 Mason, John...Worsleditch Farm, Kimbolton, Hants.
 Mason, John...Wrest Park, Silsoe, near Bedford
 Mason, Mathew...Baddon, Chelmsford, Essex
 Mason, Richard...Pound, Leominster, Herefordsh.
 Mason, T...Fallinsburn Cottage, Coldstream, N. B.
 Mason, Wm...Neeton Hall, Swaffham, Norfolk
 Mason, Wright...Northolme, Wainfleet, Lincs.
 Massey, Edward...Thrumpton, near Nottingham
 Massingberd, Rev. A...Gunby Park, Spilsby, Linc.
 Master, Chas. Legh Hoskins...Barrow Green House, Oxted, near Godstone, Surrey
 Master, Colonel...Knole Park, near Bristol
 Master, Thos. William Chester, M.P...Knole Park, Almondsbury, near Bristol
 Masterman, Thos. J...Little Danby, Northallerton, Yorkshire
 Masterson, James....Collingbourne Ducis, Marlborough, Wiltshire
 Matcham, Geo...New House, Downton, Salisbury
 Mather, Jos...Bull Bridge, near Alfreton, Derbysh.
 Mather, F. H...Swanton, near Liverpool
 Mathews, Isaac...Marlton, Newbury, Berkshire
 †Mathews, Jeremiah...Park Hall, Kidderminster, Worcestershire
 Mathews, John...Cheveiley, Newbury, Berkshire
 Mathews, Philip...Burton, near Ross, Herefordshire
 Mathews, Samuel...Ilton Hill, near Chepstow, Monmouthshire
 Mathias, W...Llambad, near Fishguard, Pembrokesh.
 Maton, James...Maddington, Devizes, Wilts.
 Maton, L. Pitt...Collingbourne, near Pewsey, Wilts.
 Matson, Chas...Baddow Park, Chelmsford, Essex
 Matson, Edw., jun...Long Hedgo House, Battersea Fields, Surrey
 Matson, Henry...Wingham, Kent
 Matson, John...Eastchurch, Isle of Sheppy, Kent
 Matson, Robert...Wingham, Kent
 Matson, Wm...St. Osyth, Colchester, Essex
 Matthews, Frank...Glynn Moore, Isle of Man
 Matthews, John...High Street, Oxford
 Matthews, John...Hungerford, Berkshire
 Matthews, P...Elkstone, Cirencester, Gloucestersh.
 Matthews, Richard...Esger, Machynlleth, Aberystwith, S. W.
 Matthews, Stephen...Swindon, Wiltshire
 Matthews, William...Baschurch, Shrewsbury
 Maud, Charles T...Sydney Place, Bath, Somerset
 Maude, Thos. Holme...Blawith Cottage, near Cartmel, Lancashire
 Maugham, Mark...Wadsley Park, Sheffield, Yorksh.
 Maughan, John...Jerveaux Abbey, Bodale, Yorksh.
 Maule, Wm...Bristol
 Mauleverer, Wm...Arncliffe Hall, Cleveland by Thirsk, Yorkshire
 Maunsell, Thos. P., M.P...Thorpe Malsor, Kettering, Northamptonshire
 Maurice, R. M. Bonnon...Bodnyfol, Oswestry
 Maw, Hy. Lister...Tetley, near Crowle, Isle of Axholme, Bawtry, Nottinghamshire
 Maw, Mat...Clenham, Kirton-in-Lindsey, Lincs.
 Maxwell, J. G...Coham, Blacktoirington, Devon.
 Maxwell, M. C...Terregles, Kirkcudbrightshire
 †Maxwell, Wm. C...Everingham Park, Pocklington, near York
 May, Chas...Ipewich, Suffolk
 May, M. Jno...Twickenham Green, Middlesex
 Maybery, Walter...Brecon
 Maydwell, Daniel...Leatherhead, Surrey
 Mayer, T. Walton...Newcastle-under-Lyne, Staffs.
 Maynard, Anthony Lex...Marton-le-Moor, Boroughbridge, Yorkshire
 Maynard, Edmund Gitting...Chesterfield, Derbysh.
 Mayos, Thomas...Langanan, Ross, Herefordshire
 Mead, Rev. Daniel...South Brewham, near Bruton, Somersetshire
 Meade, The Hon. Gen...48, Bryanston Square
 Meats, John...Bridge House, Wellington, Hereford.
 Mechi, John Joseph...4, Lendonhall Street, London
 †Medlycott, Sir Wm. Coles, Bart...Millborne-Port, Wincanton, Somersetshire
 Mee, John...East Retford, Nottinghamshire
 Meeson, John...Grays, Essex
 Meggison, George...61, Cannon Street, City
 Meire, J., jun...Uokington, near Shrewsbury, Salop
 Meire, S...Berrington, near Shrewsbury, Salop

- Meire, T. L....Cound Arbor, nr. Shrewsbury, Salop
Mellor, James...Shifnal, Shropshire
Mellor, John...Little Aston, Lichfield, Staffordshire
Mells, Wm...Norton Terrace, Mere, Wiltshire
Melville, Hon. A. L....Branston Hall, near Lincoln
Melville, Rev. W. R....Rector of Matlock, Derbysh.
Menlove, Jos...Middle, near Shrewsbury, Shropshire
Meredith, Lewis...Shrewsbury, Shropshire
Merest, Charles W....The Priory, Farnham, Bury St. Edmunds
Merrington, D. W....Fulbourn, near Cambridge
Messiter, Henry...Wincanton, Somersetshire
†Metcalfe, Chas. James, jun...Chawson House, near St. Neot's, Huntingdonshire
Meux, Sir Henry, Bart...Theobald's Park, Waltham Cross, Herefordshire
Meyer, James...Forty Hall, Enfield, Middlesex
Meyer, Ph. Herman...Standon Place, Ongar, Essex
Meynell, John...Tipton Grove, near Chesterfield, Derbyshire
Meyrick, Owen Fuller...Bodorgan, Anglesey, N. W.
Meyrick, Wm...Gwailod-y-Garth, Merthyr-Tydvil
Michel, Lieut.-Col....Dewlish House, Blandford, Dorsetshire
Mickleburgh, Charles...Montgomery
Micklethwait, Sir Peckham, Bart...Iridge Place, Hurst Green, near Lamberhurst, Sussex
†Middleton, Viscount...26, Upper Brook Street
Middleton, Jno...Sparham, near Reepham, Norfolk
Middleton, Richard...Fitz, Shrewsbury
Midgley, Thomas...Buersell, Rochdale, Lancash.
Miles, John...Wexcombe, Great Bedwin, Wilts.
†Miles, John William...Leigh Court, Bristol
†Miles, P. W. S., M.P....Leigh Court, Bristol
Miles, Roger Dutton...Keyham, Leicestershire
Miles, Thos...Keyham, near Leicester
Miles, Wm. Marsh...Nonington, Wingham, near Dover, Kent
Milhouse, William...Barwell Hall, near Hinckley
Mill, Sir Jno. Barker, Bart...Mottisfont Abbey, near Romsey, Hants
†Miller, B...Chapel Brampton, Northamptonshire
Miller, Giles...Gondhurst, near Lamberhurst, Kent
Miller, Henry...Frome, Somersetshire
Miller, Rev. M. H....Scarborough, Yorkshire
Miller, Thos...Castle Farm, Sherborne, Dorsetshire
Miller, T. B...Thorpe Villa, Loughborough, Leicestsh.
Miller, Wm...East Hampstead, Bracknell, Berks.
Miller, Wm...Water Eaton, near Oxford
Millett, C...Elm Place, Bishop's Waltham, Hants.
Millington, Bryan...Asgarby, Sleaford, Lincolnshire
Mills, John...Castle Gate, Nottingham
Mills, John...Bissterne, Ringwood, Hampshire
Mills, Rev. J....Pembroke College, Cambridge
Mills, Robert...Inkpen, Hungerford, Berkshire
Mills, Samuel...20, Russell Square
Mills, Stephen...Elstone House, Devizes, Wilts.
Mills, Wm...Saxham Hall, Bury St. Edmunds, Suff.
Mills, Rev. P. W...Skellingford, Faringdon, Berks.
†Milne, Alex...1, Whitehall
Milne, O., jun...Prestwick Wood, near Manchester
Milner, Sir Wm., Bart...Nunappleton, Tadcaster, Yorkshire
Milner, Wm...Nunappleton, Tadcaster, Yorkshire
Milnes, Jas...Woodend, near Matlock, Derbyshire
Milnes, Jno. L....Hilgay Lodge, Downham Market, Norfolk
Milnes, R. Monckton, M.P....Pryston Hall, Pontefract, Yorkshire
Milnes, W...Stubbedged Hall, nr. Alfreton, Derbysh.
Milward, G...Manor House, Letchdale, Gloucesters.
Minchin, Robert Earwaker...Bishop's Sutton Farm, Alresford, Hampshire
Minett, Chas. Wm...7, Token House Yard, London
Minett, William...Crumpwell, Oswestry
Minnett, Joshua Robt...Annabeg, Nenagh, Ireland
Minor, John Bishton...Astley House, Shrewsbury
Mitchell, John...Wymondham, Norfolk
Mitchell, John...5 A, Hawley Road, Kentish Town
†Mitford, Wm. Townley...Pitshill, Petworth, Sussex
Mogg, Jno. George...Stowey, near Pensford, Bristol
Mogg, Jno. Jenner...West Park, Bristol
Mogg, John Rees...Stowey, near Pensford, Bristol, Somersetshire
Mold, Chas. Jno...Makney, Duffield, near Derby
†Molesworth, Sir Wm., Bart...Pencarrow, near Bodmin, Cornwall
Molyneux, J. M...Loseley Park, Guildford, Surrey
Monck, J. Bligh...Coley Park, Reading, Berkshire
Monckton, Edw...Somerford Hall, Wolverhampton, Staffordshire
Monckton, Geo...Stretton, Wolverhampton, Staffs.
Monk, C. A...Humshaugh, Hexham, Northumb.
Monkhouse, John...The Stowe, near Hereford
Monington, Thos...Sarnesfield Court, Hereford
Monins, John...Ringwould, near Dover, Kent
Monteagle, Lord...Mount Trenchard, Limerick, Ireland
Montgomery, Arthur Hill...Tysella House, Clough, Co. Down, Ireland
Moody, C. A...Kingsdon, Yeovil, Somersetshire
Moore, Rev. B...Rector of Staveley, Chesterfield
Moore, Edw. Wells...Colehill, Faringdon, Berks.
Moore, George...Appleby Hall, Ashby-de-la-Zouch, Leicestershire
Moore, George...Messing, Kelvedon, Essex
Moore, Rev. G. B...Tunstall, Sittingbourne, Kent
†Moore, H...Redbourn, Kirtan-in-Lindsey, Lincsh.
Moore, James...Shrewsbury
Moore, John...Church Street, Warwick
Moore, John...Appleby, Ashby-de-la-Zouch
Moore, John Kirby...Badley, Stowmarket, Suffolk
Moore, Robert C...Harmslow, near Lincoln
Moore, Thomas...Syston, near Leicester
Moore, Thomas...Ruddington, near Nottingham
Moore, Thomas, jun...Shelford, Braintree, Essex
Moore, Wm...Callow Land Farm, Watford, Herts.
Moore, Rev. William...Brimpsfield, Cirencester
Moore, Wm...Elm, Wisbeach, Cambridgeshire
Morant, J...Brookenhurst, near Lyndhurst, Hants.
Morcombe, Joel...Bristol
Mordaunt, Rev. C...Badgworth Rectory, near Cross, Somersetshire
Morewood, Col. W. F...Alfreton Park, Derbysh.
Morgan, Charles...Llanrhidian, Gower, Swansea
Morgan, C. M. R., M.P...Rapona Castle, Glamorg.

- Morgan, Capt. E...Golden Grove, Holywell, Flintsh.
 Morgan, Francis...51, Bedford Square
 Morgan, G...Biddlesden Park, Brackley, Northamp.
 Morgan, Philip...Defynnock, near Brecon, S. W.
 Morgan, Robert...41, West Smithfield
 Morgan, T...Maesgwrdr, St. Clears, Carmarthensh.
 Morgan, Wm...Brampton Park, near Huntingdon
 Morice, George...Eling, Southampton
 Morison, Alex. J., M.D...Portcleu, near Pembroke
 Morland, George Bowes...Abingdon, Berkshire
 †Morland, Thos. T...Sheepstead, Abingdon, Berks.
 Morland, Wm. C...Pickhurst, Bromley, Kent
 Morley, Benjamin...Snenont, near Nottingham
 Morley, Earl of...Saltram, Plymouth, Devonshire
 Morley, James...Stanton Hall, Stanton-by-Dale, near Derby
 †Morley, John...
 Morley, Joseph...Breadsall, near Derby
 Morley, Richard...Snenont, near Nottingham
 Morley, Wm. Bateman...Mugginton, near Derby
 Morrell, Frederick J...Oxford
 Morrell, James, jun...Headington Hill, Oxford
 Morris, Clarke...Oakham Grange, Rutlandshire
 Morris, George...Gosfield, Halstead, Essex
 Morris, George Byng...Sketty Park, Swansea
 Morris, Henry...Gosberton, Spalding, Lincolnsh.
 Morris, Henry...Maldstone
 Morris, John...Cone Mill, Alvington, Chesham, Monmouthshire
 Morris, John...Leasons, Clun, Bishop's Castle, Salop
 Morris, J...Leasons, near Clun, Bishop's Castle, Shropshire
 Morris, Lewis...Mount Pleasant, near Carmarthen
 Morris, Philip...Newbury, Bromyard, Herefordsh.
 Morris, Philip...The Hurst, Ludlow
 Morris, Thomas...Woolpack Lane, Nottingham
 Morris, William...Carmarthen
 Morris, Charles C...Loddington Hall, Uppingham, Rutlandshire
 Mortimer, John...Iden, near Rye, Sussex
 Mortimore, Rich...Silvertown, near Exeter, Devon
 Mortlock, Henry...Caxton, Cambridgeshire
 Morton, James...Parham, Storrington, Sussex
 Morton, J. C...Whitfield, near Thornbury, Gloucester.
 Morton, John D...Lower Wick, near Worcester
 Morton, William...Ripon, Yorkshire
 Moseley, Chas...New Barns, Ely, Cambridgeshire
 Moseley, Robert...Derby
 Mosley, A. N. E...Burnaston House, near Derby
 Mosley, Sir Oswald, Bart...Rolleston Hall, Burton-on-Trent, Staffordshire
 Mosley, T...East Lodge, Burton-on-Trent, Staffs.
 Mosley, Thos...Edensor, near Bakewell, Derbysh.
 Moss, Cottingham...Aigburth, Liverpool
 Moss, F...Whiston Hall, near Rotherham, Yorksh.
 Moss, Jas. C...Kempston Lodge, Swaffham, Norf.
 Moss, John...Derby
 Moss, John...Liverpool
 Moss, Joseph...Aughton, near Rotherham
 Moss, Thomas...Oxterspool, Liverpool
 Moss, Wm...Uily, near Rotherham, Yorkshire
 Mossop, John...Moulton Marsh, Spalding, Linc.
 Mostyn, Charles...Newport, Monmouthshire
 Mostyn, Sir P., Bart...Talcro, Holywell, Flintsh.
 Mott, John...The Close, Lichfield, Staffordshire
 Mott, John, jun...Portswold Lodge, Southampton
 Mott, J. T...Barningham Hall, Aylsham, Norfolk
 Mott, William...Wall, Lichfield, Staffordshire
 Moulst, Wm...Knowsley, Prescot, Lancashire
 Mount Edgecumbe, Earl of...Mount Edgecumbe, Devonport
 Mount, Thomas...Saltwood, Hythe, Kent
 Mount, Wm...Wasing Place, Newbury, Berks.
 Mountain, Rev. Thomas...Beighton Villa, Sheffield, Yorkshire
 Mountford, Geo...Pentrebyling, Churchstoke, Salop
 Mousley, Isaac...Sandwell, near Birmingham
 Mousley, William Eaton...Derby
 Moyse, J. V...Milton, Sittingbourne, Kent
 Mozley, Charles...Liverpool
 Mozley, Elias Joseph...Liverpool
 Mudge, Lieut.-Col. Rich., R.E...Beechwood, Plymouth, Devonshire
 Mules, William...The Grove, Colchester, Essex
 Mullins, C...Chew-Magna, near Bristol, Somerset.
 Mumford, George...Downham Market, Norfolk
 Mumford, Geb...Little Cornard, Sudbury, Suffolk
 Mundy, Chas. J. H...Mavis Enderby, near Spilsby, Lincolnshire
 Mundy, Edwd. M., M.P...Shipley Hall, Derbysh.
 Mundy, Stephen...Kennington, Oxford
 Mundy, William...Marketon, near Derby
 Munn, Fred...Temple Langham, Faversham, Kent
 Munn, Wm. Augustus...Throwley House, near Faversham, Kent
 Munro, Henry D...Druidstoke, Bristol
 Murdoch, James Gordon...11, Haymarket
 Murray, Jas...Kinnell Park, St. Asaph, Flintsh.
 Murray, Thomas...Rumford Street, Liverpool
 Murton, Frederick...Whitstable Parsonage, Kent
 Murton, John...Cooling Castle, Rochester, Kent
 Murton, Wm...Tunstall, Sittingbourne, Kent
 Muscott, J...Westonbury, near Pembridge, Herefordshire
 †Musgrave, Sir G...Edenhall, Penrith, Cumberland
 Mushett, Geo. Arthur...Millfield House, Edmonton
 Muskett, Charles...Royden, Diss, Norfolk
 Muskett, Charles...Fensfield Hall, Diss, Norfolk
 Muskett, John...Fornham, Bury St. Edmunds, Suff.
 Musson, Jas...Colstersworth, Grantham, Lincolnsh.
 Musters, John...Colwick Hall, Nottingham
 Myers, John D...Langford, Lechlade, Gloucestersh.
 Myers, Wm. Joseph...Aigburth, Liverpool
 Mytton, Rev. D. F. Glynn...Llandysill, near Montgomery
 Mytton, T...Shipton Hall, Much Wenlock, Salop
 Nainby, Richard...Barnolby-le-bek, near Grimsby, Lincolnshire
 Nairn, Philip...Waren, Belford, Northumberland
 Naish, W. B...Stoneaston, near Wells
 Napier, Edwd. B...Pennard House, Shepton Mallett
 Napier, Peach...Mousehole Foundry, Millbrook, Southampton
 Napper, John...Ifold, Petworth, Sussex
 Nash, Charles...Biggleswade, Bedfordshire

- Nash, Charles...Royston, Hertfordshire
 Nash, Daniel...60, Strand
 Nash, James...Chesham, Buckinghamshire
 Nash, John...Reigate, Surrey
 Nash, Joseph...Reigate, Surrey
 Nash, Joseph...Walesby, near Market Rasen
 Nash, Peter...Cambridge
 Nash, Peter...Gt. Chesterford, Saffron Walden, Ess.
 Nash, Thos...Carlton Grange, Newmarket, Cambs.
 Nash, Thomas, jun...Chesham, Buckinghamshire
 Nash, Wedd, William...Royston, Hertfordshire
 Nayle, J. C...Calverleigh Court, near Tiverton, Devonshire
 Naylor, John...Hartford Hill, Northwich, Cheshire
 Neale, Charles...Mansfield Woodhouse, Notts.
 Neale, H. St. John...Ringwood, Hampshire
 Neale, Stephen...Tytherington, Warminster, Wilts.
 Neame, Charles...Selling Court, Faversham, Kent
 Neame, Frederick...Hoths Court Farm, Blean, near Canterbury
 Neame, John...Selling, Faversham, Kent
 Neave, Richard Digby...Pitt House, Epsom
 Neave, Sheffield...8, Albemarle Street
 Neema, John...Proccaster, Stroud, Gloucestershire
 Neilson, Daniel...Bedford Street, Liverpool
 Neilson, R...Halewood, Rotunda Club, Liverpool
 Nelson, Rev. J...Sparsholt House, Wantage, Berks.
 Nesbit, John C...38, Kennington Lane, Lambeth
 Neve, John...Tenterden, Kent
 Neve, Thomas...Benenden, Cranbrook, Kent
 †Neville, Rev. Christ...Thorney, Newark, Notts.
 Nevill, John...Packington, Lichfield
 Nevill, R. J...Llangennech Park, near Swansea, Carmarthenshire
 Neville, Ralph, M.P...23, Hill Street
 Newbatt, Ed...Kimpton, Grantham, Lincolnshire
 Newbery, Charles...Godstone, Surrey
 Newbould, William...Intake, Sheffield
 †Newburgh, Earl of...Hassop Hall, Bakewell, Derbyshire
 Newill, T...Spring Bank, Welshpool, Montgomerysh.
 Newington, Joseph, jun...Efficks, Horsmonden, near Lamberhurst, Kent
 Newby, Richard...17, Trinity Street, Cambridge
 Newdegate, C. N...Arbury, Coventry, Warwickshire
 Newdigate, Francis...Blackheath, Kent
 Newill, Joseph...Walcot, Bishop's Castle, Salop.
 Newland, Robert...Kempston, Bedford
 Newman, Caswell...Scrips, Coggeshall, Essex
 Newman, Chas...Court Farm, Hayes, Uxbridge
 Newman, Edwin...Yeovil, Somersetshire
 Newman, Jacob...Eastcote, Devizes, Wiltshire
 †Newman, John...Brands House, High Wycombe, Buckinghamshire
 Newman, Joshua...Bayford Hall, near Hertford
 Newman, Robert...Neasden, Willesden, Middlesex
 Newman, T...Mamhead, near Exeter, Devonshire
 Newman, W...Darley Hall, Barnesley, Yorkshire
 Newstead, Thomas, jun...Dunham, Newton, near Retford, Nottinghamshire
 Newton, Rowley Bradley...Brunswick Street, Macclesfield, Cheshire
 Newton, Marcellus...Warham, near Hereford
 Newton, Ralph John...Sawtry, Stilton, Hants.
 Newton, Thomas F...Dogdean, Wiltshire
 Newton, William...Bay Farm, near Bath, Somerset
 Newton, William...Evedon Hall, Thetford, Norfolk
 Niblett, D. J...Haresfield Court, near Gloucester
 Nice, T...Great Bradley Hall, Newmarket, Cambs.
 Nicholl, The Right Hon. John...Merthyr Mawr, Glamorganshire
 Nicholls, George...17, Hyde Park Street
 Nicholls, R. D...Bryncremaishire, Welshpool, Montgomeryshire
 Nicholson, Brady...Wootton Barrow, near Barton-on-Humber, Lincolnshire
 Nicholson, Calvert...Bunny, near Nottingham
 Nicholson, E. A...Burford St. Martin, Salisbury, Wiltshire
 †Nicholson, Geo. T...Waverley Abbey, Farnham, Surrey
 Nicholson, Thomas...Grayingham Grange, Kirtlington-Lindsey, Lincolnshire
 Nicholson, W...Leverton, Eastfen, Boston, Lincoln.
 Nicholson, William Nursam...Newark-upon-Trent
 Nickisson, John...Stone, Staffordshire
 Nicklin, Richard...Glen Ville, Douglas, Isle of Man
 Nightingale, J...Faceby Lodge, Stokesley, Yorkshire
 Nightingale, Peter...Worsley, near Manchester
 Nightingale, Richard...Lyndhurst, Hampshire
 †Nightingale, W. E...Embley, near Romsey, Hants.
 Nixon, William...Kirkdale, near Liverpool
 Noble, William...152, Fleet Street
 Nock, John...Kinner, Stourbridge, Worcestershire
 Nock, Thomas...Bridgenorth, Shropshire
 Nockolds, J. A...Stanstead, Essex
 Nockolds, Martin...Saffron Walden, Essex
 Nodder, Rev. J...Ashover Rectory, Chesterfield, Derbyshire
 Noel, Chas...Bell Hall, Bromsgrove, Worcestershire
 Norman, Ed...Mistley Place, Manningtree, Essex
 Norman, George...Goadby Marwood, near Melton Mowbray
 Norman, J. M...Slangham Park, Crawley, Sussex
 Norreys, Lord, M.P...Wytham Abbey, near Oxford
 Norris, James...Debenham, Suffolk
 †Norris, John...Hugdenhouse, High Wycombe, Buckinghamshire
 Norris, W. John...19, Bedford Place, Russell Square
 North, Chas...South Thoresby, Spilsby, Lincolnsh.
 North, Frederick...Rougham, Swaffham, Norfolk
 North, Lieut.-Col...Wroxton Abbey, Banbury, Oxon
 North, Nicholas...Wiggenhall, St. Mary Magdalen, near Lynn, Norfolk
 Northcote, George B...Aixbridge, Somersetshire
 Northcote, Henry Stafford...Pynes, Exeter, Devon.
 Northeast, T. B...Tedworth, Marlborough, Wiltshire
 Northey, Edward Richard...Epsom, Surrey
 Northhouse, Wm. Spencer...Sorey's Gate Hotel, Great George Street, Westminster
 Norton, J...Broadway Hall, Bishop's Castle, Salop
 Norton, William Fletcher Norton...Elton Manor, Grantham, Lincolnshire
 Notman, Andrew...Painswick, Stroud, Gloucestersh.
 Nott, J. C...Hallow, near Worcester
 Noyer, J. W. F...Laverstock Hall, Salisbury, Wilts.

- Noyes, Thomas H...East Marscalls, Linfield, near Cuckfield, Sussex
 Nunn, C...Little Bromley Hall, Colchester, Essex
 Nunn, John Vincent...Abbeygate Street, Bury St. Edmunds, Suffolk
 Nurse, W. M...Great Cell Barns, St. Albans, Herts.
- Oakden, D...Bentley Hall, Ashbourne, Derbyshire
 Oakden, John...Waresby, Caxton, Cambridgeshire
 Oakes, T. H...Riddings House, Alfreton, Derbysh.
 Oakley, John...Darland, Chatham, Kent
 Oakley, Thomas...Water-end Farm, Sandridge, St. Alban's, Hertfordshire
 Oatley, W. H...Wroxeter, Shrewsbury, Shropshire
 O'Brien, Stafford...Blatherwycke Park, near Stamford, Lincolnshire
 Odams, James...Bishop Stortford, Hertfordshire
 Ogden, John Biss...Bury Hill, Coldstream, near Berwick-on-Tweed, N. B.
 †Ogden, John Maude...Sunderland
 Ogilvie, Alex...28, Northumberland Street, Strand
 Ogilvie, George...Caine, Wiltshire
 Ogilvy, The Hon. Col. Donald...Balnaboth House, Kirriemuir, N. B.
 Ogilvy, Sir John, Bart. ...Baldovan House, near Dundee, N. B.
 Okes, John...Cherry Hinton, Cambridge
 Oldfield, Edmund...Ashill, Watton, Norfolk
 Oldknow, Henry...Draycott, near Derby
 Oliver, Francis...Dorchester, Dorsetshire
 Oliver, James...Hanford, Blandford, Dorsetshire
 †Oliver, John...Abingdon, Berkshire
 Oliver, William...New Cross, Deptford, Kent
 Oliver, William...Courtlands, Arundel, Sussex
 †Oliverson, Richard...14, Portland Place
 Olivier, Col. Henry Stephen...Potterne Manor House, Devizes, Wiltshire
 Oliver, George...Kingston, near Arundel, Sussex
 O'Neill, Francis...Liverpool
 Onions, John...Broseley, Shropshire
 Onley, Onley Savill...Stisted Hall, Braintree, Essex
 Onslow, Hon. Col. C...Upton House, Alresford, Hampshire
 Onslow, Phipps V...Snockley, Worcester
 Ord, W., M.P...Whitfield Hall, Hexham, Northumberland
 Orde, Rev. John...Winslade Rectory, Basingstoke
 Orlebar, R. Longuet...Hinwick, House, Wellingborough, Northamptonshire
 Ormerod, George...Fern Hill, near Rochdale, Manchester, Lancashire
 Ormerod, George...Sedbury Park, Chesham
 Orrell, John...37, Great George Street, Liverpool
 Orton, F...Bottisford, near Grantham, Lincolnsh.
 Orton, R. B...Bank House, Tattenhall, near Chester
 Osborn, Charles...Fareham, Hampshire
 Osborn, Geo...Glanbrogan, Llanfechan, Carmarthen
 Osborn, Geo., jun...Manor House, Pattishall, near Northampton
 Osborn, George...Waterloo Terrace, Northampton
 Osborn, Geo...Court Farm, Eltherton, near Thrapston, Gloucestershire
 Osborn, George...Spencer, near Derby
- Osborne, R...Berwick Lodge, Henbury, near Bristol
 Oslar, Thomas...Fulbourn, near Cambridge
 Oslar, Thomas...Bristol
 Oswell, Thomas S...Ellesmere, Salop
 Overman, C. E...Burnham Westgate, Norfolk
 Overman, Hen...Weasenham, Fakenham, Norfolk
 Overman, Henry R...Weasenham, Rougham
 Overman, Jno...Burnham Sutton, Burnham Westgate, Norfolk
 Overman, T. W...Maulden, Ampthill, Beds.
 Owen, E. W. S...Condover, Shrewsbury, Salop
 Owen, Henry...Worksop, Nottinghamshire
 Owen, John...Field House, Marchington, near Uttoxeter, Staffordshire
 Owen, Jno...Lynn, near Shenston, Lichfield, Staffs.
 Owen, Rich...Baddley Cottage, Nantwich, Cheshire
 Owen, William...Wern, Salop
 Owen, William...Blesington, Ireland
 Owen, Wm...Woodhouse, Oswestry, Shropshire
 Oxford, Bishop of...Cuddesdon, Wheatley, Oxon
 Oxford, Earl of...Eyywood, Kington, Herefordsh.
- †Packer, Rev. Augustus...Walton Rectory, Loughborough, Leicestershire
 Packe, Col. H...Twysford Hall, Guist, Norfolk
 †Packe, G. H...Caythorpe Hall, Grantham, Linc.
 †Packe, Dr. Jas...Vice-Provost of King's Col., Cam.
 Padwick, Fred...West Bourne, Essex
 Padwick, Wm...Manor House, Hylking, Kent
 Padwick, Wm, Frederick...Manor House, Hayling, Havant, Hants
 Pagan, John...Wavertree, Liverpool
 Page, James...Merton, Surrey
 Page, R...Charlton Mackerell, Somerset, Somerset.
 Page, Thomas...Ely, Cambridgeshire
 Paget, C...Raddington Grange, near Nottingham
 Paget, E. Arthur...Thorpe, near Leicester
 Paget, G. B...Sutton Bonington, Kegworth, Leicestershire
 Paget, Henry...Birstal, near Leicester
 Pain, George...Salisbury
 Pain, Joseph...Felmersham, near Bedford
 Pain, P...Boughton House, Kettering, Northamptonshire
 Pain, Wm...Compton, near Winchester, Hants.
 Paine, John Mainwaring...Farnham, Surrey
 Paine, William...Milden Hall, Suffolk
 Palgrave, Charles Frederick...Bedford
 Palin, John...Christleton, near Chester
 †Palin, Wm...Stapleford Hall, near Chester
 Palmer, Arthur Hare...Bristol
 †Palmer, Sir Geo. J., Bart...Wanlip Hall, Leicester
 Palmer, Geo., M.P...Nazing Park, Waltham Abbey, Essex
 Palmer, H...Brightwaltham, near Wantage, Berks.
 Palmer, James...Weston, Newbury, Berks.
 Palmer, John...Hearn, near Canterbury, Kent
 Palmer, Sir John H., Bart...Catton Park, Rookingham, Northamptonshire
 †Palmer, Rev. Philip H...Walsthorpe Rectory, Grantham, Lincolnshire
 Palmer, Wm...Green Lane, Fockham, Worcester
 Palmer, Wm...Enfield Highway, Hatfield, Middx.

- Palmer, Wm. James...St. Mary Hall, Oxon; and The Close, Lichfield
- Palmer, Wm. H...East Garston, Lambourn, Berks.
- †Palmerston, Viscount, M.P...Broadland, Romsey, Hants
- Pank, John...Oxney, Peterborough, Northampt.
- Pantlin, James Henry...Westcote Rectory, Stow-on-the-Wold, Gloucestershire
- Papillon, Thos...15, Marlborough Buildings, Bath
- Papillon, Rev. John...Lexdon, Colchester, Essex
- Pardoe, Rev. George...Hopton Castle, Ludlow
- Pardoe, James...Sion Hill, Kidderminster
- Pares, Thomas...Hopwell Hall, near Derby
- Parfitt, E...Avington Farm, Winchester, Hants
- Parham, Wm...Sutton-Veney, Warrminster, Wilts.
- Paris, Thomas...Greenwood, near Barnet, Middlx.
- Park, Philip...Preston, Lancashire
- Purke, C., jun...Lower Henbury, Wimborne, Dorset.
- Parker, C. G...Springfield Place, Chelmsford, Essex
- †Parker, Chas. S...Annesley, Liverpool, Lancash.
- Parker, Harrington...Parbold Hall, Standish, Wigan
- Parker, Henry...Fairford, Gloucestershire
- Parker, Sir Hyde, Bart...Melford Hall, Long Melford, Suffolk
- Parker, John...Liverpool
- Parker, J. O...Woodham Mortimer, Maldon, Essex
- Parker, K. S., Q.C...13, New Square, Lincoln's Inn
- Parker, Rich...Belle Vue, Castle Hill, Dover
- Parker, Rev. R., M.A...Welton, near Spilsby, Linc.
- Parker, Robt. T...Cuenden Hall, Preston, Lancash.
- Parker, T...Martyr Worthy, near Winchester, Hants
- Parker, Thos. H...Park Hall, near Longton, Staffs.
- Parker, T. N...Sweeney, Oswestry, Shropshire
- Parker, Viscount...Sherburn Castle, Tetsworth, Oxon
- †Parker, William...Yanwath Hall, near Penrith, Cumberland
- Parker, Wm...Skiwith Abbey, Penrith, Cumberld.
- Parker, Wm...The Park, Ware, Hertfordshire
- Parker, Capt. W...Clopton Hall, Woolpit, Suffolk
- Parker, Rev. William...Rectory, Little Comberton, Pershore, Worcestershire
- Parker, Rev. W. H...Soham Rectory, Watton, Norf.
- Parkes, Josiah...11, Great College St., Westminster
- Parkhurst, T. W...Dartford, Kent
- Parkins, E...Chesfield Lodge, Stevenage, Herts.
- Parkinson, Chas...Wilsford Hall, Sleaford, Linc.
- Parkinson, John...Leyfields, Newark, Notts.
- Parkinson, John...Kinnerley, near Hereford
- Parkinson, John...86, Lincoln's Inn Fields
- Parkinson, John, jun...Hexgrave Park, Southwell, Notts.
- Parkinson, J. L...26, Cloudeley Terrace, Islington
- Parkinson, William...Sawley, near Derby
- †Parkyns, Capt. Geo...Chadiston Park, Halesworth, Suffolk
- Parlby, Joshua...West Watting, Linton, Cambs.
- Parmiter, Edward...Beaulien, Southampton
- Parmiter, Samuel...High Street, Southampton
- Parr, T...Grappenhall, Heyes, Warrington, Lanca.
- Parris, J...Farnham, near Bishops Stortford, Herts.
- Parrott, Jasper...Dundridge, Totnes, Devonshire
- Parrott, Thos...Green Bank, Sutton, Macclesfield, Cheshire
- Parry, Abel...Charlton, near Henbury, Bristol
- Parry, Evan...Cwmdu, Crickhowell, Brecknocksh.
- Parry, G. F...Duiske Lodge, Ayrshire, N. B.
- Parry, W...Noyadd-fri, Cwmdu, Crickhowell, S.W.
- Parry, Nicholas...Little Hadham, Ware, Herts.
- Parry, Robert...Bowers Hall, near Wrexham
- Parsoe, Joseph...Thornbury, Gloucestershire
- †Parsons, George...West Lambrook, South Petherton, Somersetshire
- Parsons, G...Bursledon, Southampton
- Parsons, James...Stoneham, Southampton
- Parsons, John...Oxford
- Parsons, John...5, Anglesea Place, Southampton
- Parsons, J. M...6, Raymond's Buildings, Gray's Inn
- Parsons, Wm., jun...Wilneot, Tamworth, Staffs.
- Partridge, Henry Samuel...Hockham Hall, East Harling, Norfolk
- Partridge, J...Bishops Wood, near Ross, Herefordsh.
- Partridge, Rev. John Anthony...Baconsthorpe, near Holt, Norfolk
- Partridge, W...Bendrose Farm, Amersham, Bucks.
- Partridge, W. C...Snare Hill, Thetford, Norfolk
- Partridge, Rev. William Edward...Horsenden House, Risborough, Bucks.
- Passand, Rev. J...Shipton Charwell, Woodstock, Oxon
- †Paterson, Geo...Poyle House, Colnbrook, Bucks.
- Patient, Ambrose, jun...Corton, Heytesbury, Wilts.
- Pattison, F. A...Coggeshall, Essex
- †Patterson, W. J...Durnford Lodge, Wimbledon, Surrey
- Patton, Edward...Upton Lodge, Widness, Warrington, Lancashire
- Paul, Walter...High Groove, Tetbury, Gloucestersh.
- Pawlett, Thos. Edwd...Beeton, Biggleswade, Beds.
- †Pawlett, Lord William...Downham Hall, Brandon, Suffolk
- Paxton, Joseph...Chatsworth, Bakewell, Derbysh.
- Paxton, Robert...Woolaston Farm, Hetha, near Bicester, Oxon
- Paxton, Thomas...Potsgrave, Woburn, Beds.
- Paxton, Wm...Langford Farm, Bicester, Oxon
- Payne, John Augustus...Quy, near Cambridge
- Payne, William...Willcott, Shrewsbury, Salop
- Peachey, Wm., jun...Elvernec, near Petworth
- Peacock, A...South Rauceby, Sleaford, Lincolnsh.
- Peacock, John A...Osbourne, Follingsham, Linc.
- Peacock, Thos...Bishop's Auckland, Durham
- Peacock, W...Thorpe Tilney, Sleaford, Lincolnsh.
- Peake, Robt...Stage Hall, March, Ely, Cambridge.
- Peake, Samuel...Silverdale, Newcastle, Staffs.
- Peake, T. Cross...Sidney College, Cambridge
- Pearce, R. M...Hill Farm, Hook Norton, Banbury, Oxon
- Pearce, S...Ruislip Manor Farm, Uxbridge, Middlx.
- Pearce, William...Kingston-Langley, Chippingham
- Pearce, William...10, Whitehall Place
- Pearman, Luke...Mercoats Hall, Barkswell, Coventry, Warwickshire
- Pearse, George...Harlington, Dunstable, Beds.
- †Pearse, Henry...Digswell House, Welwyn, Herts.
- Pearse, J. G...Southmoor, nr. Barnstaple, Devon.
- Pearse, Thomas...Lancroft, Cornwall

- Pearson, Rev. J...Rector of Suckley, near Worcester
 Pearson, Wm...Husband's Bosworth Grange, near Welford
 Pearson, Sir Wm. Hyde...16, Hanover Square
 Peck, Rev. Edw. A...Wyton, near Huntingdon
 Peck, Rev. Edw. M...Wyton, near Huntingdon
 Peck, Walter...Wyton, near Huntingdon
 Peck, Rev. Wm...Hilton, St. Ives, Huntingdonshire
 Peck, Wm. B...Broad Street, Bristol
 Padder, Edw...Clifton Hall, Preston, Lancashire
 Peddle, Jno. Geo. Andrews...Speckington Farm, Ilchester, Somersetshire
 Peed, Anthony...Cambridge
 Peed, John...Whittlesey, Cambridgeshire
 Peel, Edmund...Bonehill House, Tamworth, Staffs.
 Peel, Rev. Fred...Willingham, Gainsborough, Lincs.
 Peel, Henry...Aylesmore House, near Chepstow, Monmouthshire
 Peel, Right Hon. W. Y...Bonhill, Fazley, Staffs.
 Peel, R. W...Long Sutton, Wisbeach, Cambridgeshire
 Peel, Wm...Talian's Park, Llandillfawr, Carmarth.
 Peers, Chas...Chislehampton, Bensington, Oxon
 Peers, Joseph...Ruthin, Denbighshire
 Pegus, Rev. P. W...Uffington Hall, Stamford, Lincs.
 Pelham, Hon. Capt. Dudley, R.N....St. Lawrence, Newport, Isle of Wight
 +Pell, Albert...Wilburton, Isle of Ely, Cambridgeshire
 Pell, Edwin...Swell Hall, near Northampton
 Pell, Jens...Chettiscombe, Tiverton, Devon.
 Pell, P. F...Tupholme Hall, near Wragby, Lincs.
 +Pell, Sir W. O...Swell Hall, near Northampton
 Pellatt, Apeley...Knowle Green, Staines
 Pells, Edw...Culpho, Suffolk
 Pelly, Richard Wilson...Upton, Essex
 Pemberton, C...Trumpington Street, Cambridge
 Pemberton, Edw, Jas...Great Sankey, Warrington, Lancashire
 Pemberton, Col. Fras. Chas. Jones...Trumpington, Cambridge
 +Pemberton, Rev. R. N...Millichope Park, Church Stretton, Salop
 Penfold, Chas...Croyden, Surrey
 Penn, Edw...Hewell, near Bromagrove, Worcestershire
 +Penn, G. J...Stoke Park, Colnbrook, Bucks.
 Pennant, Rev. T...Rynbells, St. Asaph, Flintshire
 Pennett, H. B...Dawlish, Devon
 Penrose, R...Clyn-y-Court, nr. Neath, Glamorganshire
 Pensam, T. I...The Leigh, near Gloucester
 Penzon, Thos...Foscote, Chipping Norton, Oxon
 Penton, Thos...Middleton Farm, Long Parish, Whitechurch, Hampshire
 Peppercorn, Geo. Arthur...St. Neots, Hunts.
 Peppercorn, Henry...Aylesford, Maidstone, Kent
 Peppercorn, John...Church Farm, Little Gaddesden, Berkhamstead, Herts.
 Peppercorn, Wm...St. Neots, Huntingdonshire
 Peppin, G. H...Oldshute Heath, Dalverton, Somerset.
 Pepps, Sir Wm. Waller, Bart...Tanridge Court, Godstone, Surrey
 +Perceval, Chas...West Haddon, Northamptonshire
 Perceval, Hon. and Rev. Chas. George...Calverton, near Stony Stratford, Bucks.
 Percy, Edw. Thos...Sherborne, Dorsetshire
 Peren, Burchell...South Petherton, Somersetshire
 Perkins, Abraham...Westfield House, Arnesby, Lutterworth, Leicestershire
 Perkins, Edw...Monknash, Cowbridge, Glamorganshire
 Perkins, F...Chipstead Place, Seven Oaks, Kent
 Perkins, J. Thorne, Peterborough, Northamptonshire
 Perkins, J...Laughton, Market Harborough
 Perkins, Matthew...Bristol
 Perkins, T...Willersborough Court, Ashford, Kent
 Perkins, Wm...Haine, St. Laurence, Thanet, Kent
 Pern, Thos...Crawley, Winchester, Hampshire
 Perrett, R...Downhead, Shepton Mallet, Somerset
 Perry, J. W...Moor Hall, Harlow, Essex
 Perry, Richard...18, Chester Terrace, Regent's Park
 Perry, Robt...Debden, Essex
 Pester, P...Dole's Ash, near Dorchester, Dorsetshire
 Peters, Daniel...College Green, Bristol
 Peters, J. W...South Petherton, Somersetshire
 Peterson, Jos...Mangotsfield, Bristol, Somersetshire
 Peterson, T. P...Mangotsfield House, Bristol, Somerset
 Petley, C. C...Seven Oaks, Kent
 Pett, Henry...Stuart, St. Nicholas, Thanet, Kent
 Pettman, Robt...Morehall Cottage, Follstone, Kent
 Phelps, Chas...Briggs Park, Ware, Herts
 Phelps, J. B...Monckton, Dorchester, Dorsetshire
 Phelps, Rev. H. Dampier...Snodland Rectory, West Malling, Maidstone, Kent
 Phelps, Robt...Monckton, Dorchester, Dorsetshire
 Phelps, Thos...Sellaick Vicarage, Ross, Herefordshire
 Phibbs, Richard...Faulkner Street, Liverpool
 Philipps, Courtenay...Swansea
 Phillips, Col. F. C...Rhuall, near Mold, Flintshire
 +Phillips, Sir Geo., Bart...Vesdon House, Chipping Norton, Oxon
 +Phillips, G. R., M.P....12, Hill Street, Berkeley Sq.
 +Phillips, J. B...The Heath House, Cheadle, Staffs.
 Phillips, J. W...Aberglasney, Llandilo, Carmarthenshire
 Phillips, Mark, M.P...The Park, Manchester
 Phillimore, W. R...Newberries, St. Albans, Herts.
 Phillips, T. J...Landue, Launceston, Cornwall
 Phillips, Chas...The Abbey, Foregate, Shrewsbury
 Phillips, Chas...Chipping Norton, Oxon
 Phillips, Edward...Monmouth
 Phillips, Frederick...The Hall Farm, Downham, Thetford, Norfolk
 Phillips, G. W...Northstead House, Bromley, Kent
 Phillips, Henry...Coventry, Warwickshire
 Phillips, Jas...Bryngwyn, near Ross, Herefordshire
 Phillips, John...Culham, Abingdon, Berkshire
 Phillips, John...Winsley Hall, Westbury, Salop
 Phillips, John...Lordship Lane, Tottenham
 Phillips, John...Royston, Hertfordshire
 Phillips, John...Brackton, Leasons, Shifnal, Salop
 Phillips, Rev. Jno...Ludlow, Salop
 Phillips, J. F. P...Giltcombe, near Totness, Devon.
 Phillips, Jos. Taylor...New Lodge, Shifnal, Salop
 Phillips, Richard...Brocton Grange, Shifnal, Salop
 Phillips, R., jun...Brocton, near Shifnal, Salop
 +Phillips, R. Biddulph...Longworth, near Ledbury, Herefordshire
 Phillips, Sir T., Knt...Newport, Monmouthshire
 Phillips, Rev. Wm. J. G...Eling Vicarage, near Southampton

- Phillott, E. P. . . . Rectory, Wickford, Essex
 Phippen, Robert . . . Badgworth Court, near Cross, Somersetshire
 Phippen, Robert . . . Bedminster, near Bristol
 Phipps, A. C. . . . Shepton Mallet, Somersetshire
 †Phipps, C. P. . . . Doe Park, Liverpool, Lancashire
 Phipps, Christopher . . . River, near Dover, Kent
 †Phipps, John Lewis . . . Doe Park, Liverpool
 Phipps, T. H. H., jun. . . . Leighton House, Westbury, Wilts.
 Pickering, Leonard . . . Welcot, Witney, Oxon
 Pickering, W. . . . Beaumont Chase, Uppingham, Rutd.
 Pickford, Thos. . . . May Fair, Manchester
 Pickin, Wm. John . . . Whittemoor, Olterton, Notts.
 Pidduck, George . . . Ankerwycke Farm, Wraybury, near Staines
 Pierpoint, Matthew . . . Crow's Nest, near Worcester
 †Piggott, Geo. G. . . . Doddershall House, Aylesbury, Buckinghamshire
 Piggott, Simon Fraser . . . Fitzhall, Midhurst, Sussex
 Piggott, Z. . . . Southfleet, Kent
 Pigott, Francis . . . Heckfield, Hartford Bridge, Hants.
 Pigott, John . . . Thropham, Rotherham
 Pigott, Sir R., Bart. . . . Patshill, Wolverhampton, Staffs.
 Pike, Aaron . . . Milton, Tewkesbury, Gloucestershire
 Pike, C. J. . . . Theobald's Park, Enfield, Middlesex
 Pike, Walter . . . Derby
 Pilcher, Chas. . . . Winkfield, near Bracknell, Berks.
 Pilcher, Jesse . . . Cheriton Court, Sandgate, Kent
 Pilgrim, Charles . . . Kingsfield, Southampton
 Pilgrim, Charles H. . . . Kingsfield, Southampton
 Pillans, Wm. . . . Alnwick Castle Gardens, Northumb.
 Pilley, Samuel . . . Sudbrooke, near Lincoln
 Pilson, Connay . . . Downpatrick, Ireland
 Pinchin, David Rice . . . Box, near Bath
 Pinckard, J. T. . . . Handley, Towcester, Northampton.
 †Pinfold, C. . . . Walton House, Fenny Stratford, Bucks.
 Pinfold, John . . . Oxford
 Pinhorn, Humphrey . . . Fordingbridge, Hampshire
 Pink, Charles . . . Hambledon, Horndean, Hants.
 Pink, Richard . . . Hambledon, Horndean, Hants.
 Pinkerton, T. . . . Ancroft Steads, Berwick-on-Tweed
 Pinkney, Rev. Dr. . . . East Sheen, Richmond, Surrey
 Pinkus, Henry . . . I, Gray's Inn Square
 Pinneger, Broom . . . Newbury, Berkshire
 Pinney, Wm., M.P. . . . The Park, Somerton, Somerset.
 Pinnix, J. A. . . . West Dean, Chichester, Sussex
 Piper, John D. . . . Calne Engain, Halstead, Essex
 Piper, R. D. . . . Gt. Abington, Linton, Cambridgesh.
 Pipon, Captain Thos. . . . Langtons, Alresford, Hants.
 Pipon, Major Thos. . . . Langtons, Alresford, Hants.
 Pitcher, Robert . . . Mayor of Lynn, Norfolk
 Pittfield, John . . . Symondsburry, near Bridport, Dorset.
 Pitt, Geo. . . . Stork's House, Wellington, Herefordsh.
 Pitt, Thomas . . . Posenall, Broseley, Salop
 Pitter, John R. . . . West End Hill, near Southampton
 Pittes, George . . . Wymoning, Frittsmouth, Hants.
 Pix, Saml. . . . Baron's Grange, Peasmarsh, near Rye, Sussex
 Pix, Thos. . . . Woodside, Peasmarsh, near Rye, Sussex
 Platt, G. E. . . . Heathfield, near Hurst Green, Sussex
 Platt, H. . . . Priestley Farm, Flitwick, Ampthill, Beds.
 Platten, G. . . . Gaywood Lodge, near Lynn, Norfolk
 Platten, John . . . King's Lynn, Norfolk
 Plaxton, Rich. . . . Cam Hall, Wanstead, Essex
 Playfair, Dr. George . . . St. Andrew's, Fifeshire
 Plenty, Edward . . . Newbury, Berkshire
 Plestow, C. B. . . . Watlington Hall, Downham, Norfolk
 Plowman, R. . . . Beck Farm, Beaulieu, Southampton
 Plummer, John . . . Siddington, Cirencester, Gloucester.
 Plummer, Wm. . . . Brislington, near Bristol
 Plumtre, J. P., M.P. . . . Fredville, Wingham, Kent
 Pocock, Chas. . . . Sulham, Reading, Berkshire
 Pocock, Geo. . . . Beaumont Farm, St. Albans, Herts.
 Pocock, H. . . . Sowley, near Beaulieu, Southampton
 Pocock, Richard . . . Hedge's Farm, St. Albans, Herts.
 Pocock, S. . . . Barnes Farm, King's Langley, Herts.
 Pocock, Thos. . . . Grittleton, Chippenham, Wilts.
 Pochin, Samuel . . . Watlington, Oxon
 Poitevin, J. H. J. . . . 20, Panton Street, Haymarket
 Pole, Peter . . . Drayton Hall, Uxbridge, Middlesex
 Pole, Rev. Reginald C. . . . Radbourne, near Derby
 Polhill, Wm. . . . Eyford, Stowe, Gloucestersh.
 Pollard, Geo. A. . . . Brockhurst, Coventry, Warwicksh.
 Pollen, Sir J. W., Bart. . . . Redenham, Andover, Hants
 Pollen, Rev. Geo. P. B. . . . Rector of Little Bookham, near Leatherhead, Surrey
 Pollet, Thomas . . . Latton, Harlow, Essex
 Pollett, Thos. . . . Park Hall, Gt. Bardfield, Braintree, Essex
 Pollock, John O. G. . . . Mountain's Town, Co. Meath, Ireland
 Poltimore, Lord . . . Poltimore, near Exeter, Devon.
 Pomfret, Richard Curteis . . . Rye, Sussex
 †Pomfret, Virgil . . . Tenterden, Kent
 Poole, Donville . . . Marbury, Whitechurch, Salop
 Poole, Edward . . . Hornend, Ledbury, Herefordshire
 Poole, James, jun. . . . Clifton, Bristol, Somersetshire
 Poole, Rev. John . . . Ennmore Parsonage, near Bridge-water, Somersetshire
 Poole, Wm. H. . . . Tenick Hall, Whitechurch, Salop
 Pooley, Thomas . . . North Wold, Norfolk
 Pope, Edward . . . Mapperton, Beaminster, Dorset.
 Pope, James . . . St. Michael's Hill, Bristol
 Pope, John . . . Symondsburry, Bridport, Dorset.
 Pope, J. A. . . . Clifton Farm, near Yeovil, Somerset.
 Pope, R. E. . . . March, Isle of Ely, Cambridgeshire
 Pope, Thomas . . . Kidbrook, Blackheath
 Pope, William . . . Toller Whelme, near Beaminster, Dorsetshire
 Porcher, Charles . . . Cliffe, Dorchester, Dorset.
 Porcher, Henry . . . Gt. Corner, Harford Bridge, Heck, Hampshire
 Porquet, M. F. de . . . Iren Foundry, Hornchurch, Romford, Essex
 Portal, M. . . . Freefolk Priory, Whitechurch, Hampshire
 Porter, Edwd. . . . Moor Critchill, Wimborne, Dorset.
 Porter, J. . . . Oswestry, Salop
 Porter, Lieut.-Colonel . . . Minterm House, Dorchester, Dorset.
 Porter, Ralph . . . Clifton, Preston, Lancashire
 Porter, Wm. . . . Hembury Fort, Honiton, Devon.
 Porter, Wm. . . . Frieston, near Boston, Lincolnshire
 Portman, Wyndham B. . . . Hare Park, Newmarket, Cambridgeshire
 Portmore, Charles Broadhurst . . . Derby
 Potter, A. L. . . . Newcastle-on-Tyne

- Potter, Edward...Chisbury, Gt. Bedwin, Wilts.
 Potter, Joseph...Horsley, Woodhouse, Derby
 Potter, R...Lydden Court, Dover, Kent
 Potter, Thomas...Chisbury, Gt. Bedwin, Wilts.
 Potter, William...Liverpool, Lancashire
 Potter, Wm. H...36, Brighton Terrace, Bristol
 Potterton, J. F...Stowe, Weedon, Northamptonsh.
 Potterton, N...Boughton Park, near Northampton
 Potterton, T. B...Clipstone, Market Harborough, Leicestershire
 Potts, T...Rising Sun, Long Benton, Newcastle-on-Tyne
 Poundley, J. W...Brook Cottage, Newtown, Montgomeryshire
 Povey, John...The Derwen, Oswestry
 †Powell, Alex...Hurdcott House, Salisbury, Wilts.
 Powell, Captain C. H...Monmouth
 Powell, Colonel...Hartwick, Hay, Herefordshire
 Powell, E. L...Abergavenny
 Powell, George...8, Beaufort Buildings, Strand
 Powell, John...Boverton Castle, Glamorganshire
 Powell, John...Watton Mount, Brecon, S. W.
 Powell, Philip...South Lands, Denham, Uxbridge, Middlesex
 †Powell, Rev. S. H...Sharon Hall, Ripon, Yorksh.
 Powell, Thomas...Woodside, Croydon, Surrey
 Powell, Thomas...Muckleton, Shrewsbury
 Powell, Rev. Thomas...Turnstone, Hereford
 Powell, Rev. Thos. John...Cantriff, near Brecon
 Powell, Colonel W. E., M.P...Nantros, near Aberystwith, S. W.
 Powell, Wm...Egley's Nunydd, Bridgend, Glamorganshire
 Powell, Wm...Tickford Abbey, Newport Pagnell
 Powles, James...Woollaston Grange, Chepstow, Monmouthshire
 Pownall, Rev. C. C. B...Milton Ernest, near Bedford
 Pownall, H...Spring Grove, Isleworth, Middlesex
 Powys, Henry P...Hartwick House, near Reading, Berks.
 †Powys, Captain T...Westwood House, Leek, Staffs.
 Poynder, Thomas...52, Wimpole Street
 Poyser, George...Weston Underwood, near Derby
 Poyser, Thomas...Wirksworth, Derbyshire
 Praed, Wm. T., M.P...35, St. James's Place
 Drake, Robt...Stagshott Farm, Wisbeach, Cambs.
 Pratt, Edw...Caldwell, Burton-on-Trent, Staffs.
 Pratt, Edw. B...Sedlescombe, Battle, Sussex
 Pratt, Fred...Gt. Saradon, Wolverhampton, Staffs.
 Pratt, Rev. H...Paston, Peterboro', Northamptonsh.
 Pratt, John...Crickhowell, Brecknockshire
 Pratt, Robt...Spelsbury, Emsay, Oxon
 Pratt, Wm...Long Inkington, Newfield, Southam, Warwickshire
 Prest, Geo...Sutton Bridge, Wisbeach, Cambridgesh.
 Preston, Captain...Borde Hill, Cuckfield, Sussex
 Price, Charles...Canon Gate, Hythe, Kent
 Price, Charles...Brighton, Sussex
 Price, Edw...Court Lodge, Pembroke, Carmarthen, Glamorganshire
 Price, Henry...Hartdip, Sittingbourne, Kent
 Price, Joseph...Monmouth
 Price, Rev. R...Rectory, Lyminge, Elham, near Canterbury
 Price, Walt. G...The Elms, Kentchurch, Herefords.
 Price, Wm...Cwintwick, Ystradgynlais, near Swansea
 Price, Wm...Benhall, near Ross, Herefordshire
 Price, Wm...Wernddu, Abergavenny, Monmouthsh.
 Price, Wm. P...Tiberton Court, near Gloucester
 Prickard, T...Dderu House, Rhayader, Radnorshire
 Priddy, Samuel...Linton, near Gloucester
 Pride, Thos...Llanvihangel, near Chepstow, Monmouthshire
 Prideaux, Sir Edmund S., Bart...Netherton, near Honiton, Devon.
 Priestley, John...Kirdreafaig, Isle of Anglesea
 Priestley, S. O...Treefan, Pwllheli, Carnarvonshire
 Prince, W...Newton, near Tamworth, Staffs.
 Pring, Benjamin...Mandlin Street, Bristol
 Pring, John...Upcott Farm, Bishop's Hull, Taunton, Somersetshire
 Pritchard, Evan...Callena, Cardiff
 †Pritchard, George...Broseley, Salop
 Pritchard, G...Llanvihangel, Abergavenny, S. W.
 †Pritchard, John...Drooley, Salop
 Pritchard, Robt...Llwydiarth Esgob, near Llanerchymedd, Anglesey
 Pritchard, R. W...India Buildings, Liverpool
 Pritt, John...King's Arms, Lancaster
 Proctor, Charles...Birmingham
 Proctor, Thomas...4, Guinea Street, Bristol
 Proctor, Sir W. B...Langley Hall, Norwich
 Probert, John...Blaenpistill, Cardigan
 Prosser, George...Elvaston Farm, Harewood, Ross, Herefordshire
 Proudlove, T. J...Tattenhall, near Chester, Cheshire
 Prower, Rev. John M...Purton, Swindon, Wilts.
 Pryme, Edw...Childwick Farm, St. Albans, Herts.
 Pryme, George...Cambridge
 Pryor, John Izard...Clay Hall, Stevenage, Herts.
 Pryor, John...Baldock, Herts.
 Pryor, Morris...Baldock, Herts.
 Pryor, Vickris...Baldock, Herts.
 Pryse, John B...Trefnanny Hall, Oswestry, Salop
 Pryse, John P...Peithill, Aberystwith, S. W.
 Pryse, Pryse, M. P...Gwyddan, Aberystwith, S. W.
 Pugh, Major David...Llanerchydol, Welshpool, Montgomeryshire
 Pulini, Hario...39, Brewer Street, Golden Square
 Pulloine, James...Orakehall, near Bedale
 Pullen, Stephen, jun...Horton, Colnbrook, Bucks.
 †Puller, Christoph. W...Youngsbury, Ware, Herts.
 Pulver, Richard...Stone Farm, Aylesbury, Bucks.
 †Punnett, P. S...Chart Sutton, Maidstone, Kent
 Purcell, Peter...Ilalverston, Kilmullin, Ireland
 Purchas, R. W...Pilstone, near Chepstow, Monmouthshire
 Purkis, John...Sturmer, Haverhill, Suffolk
 Purkis, Wm...Balsham, Linton, Cambridgeshire
 Purrait, John...Moins Farm, near St. Albans, Herts.
 Purser, Edward...40, Bridge Street, Blackfriars
 Purton, Thos. P...Faintree, Bridgenorth, Salop
 Purves, Peter...Kimbolton, Hunts.
 Putland, Henry...Hunt Green, Sussex
 Pyatt, Abraham...Wilford, near Nottingham

Pye, Henry A...Louth, Lincolnshire
 Pye, Henry J...Clifton Hall, Tamworth, Staffs.
 Pym, Charles...15, Montague Pl., Russell Square
 Pyne, William...Bradley, near Great Malvern

Quarrell, T...Compton House, Newent, Gloucestersh.
 Quartly, Jas...Molland House, South Molton, Devonshire
 Quested, George...Ash, near Wingham, Kent
 Quick, George...Royal York Hotel, Southampton
 Quicke, Rev. Andrew...Winchester, Hampshire

Racster, William...Thingehill, near Hereford
 Radcliffe, Fred. P. D...The Priory, Hitchin, Herts.
 Radcliffe, Rev. W...Warleigh, Plymouth, Devonsh.
 Radclyffe, Chas. James...Hyde House, Bere Regis, Blandford, Dorsetshire

Radford, Edw...Tansley Wood, Matlock, Derbysh.
 Radford, John...Boroughfields, Burton-upon-Trent, Staffordshire

Radford, John...Smalley, near Derby
 Raine, W. Surtees...9, Lansdown Place East, Bath, Somersetshire

Rammell, E. Wootton...Dandelion, near Margate, Thanet, Kent

Ramsay, Geo. Heppel...Derwent Villa, Newcastle-upon-Tyne, Northumberland

Ramsay, John...9, Endsleigh Street

Ramsay, P...69, Chatham Street, Liverpool

Ramsay, William Alexander...Balmaln, N. B.

Ramsden, Robert...Carlton Hall, Worksop, Notts.

Rapce, Henry...Petty Cury, Cambridgeshire

Randall, John...Bridgend, Cardiff, Glamorganshire

Randall, Richard...Tunbridge Wells, Kent

Randolph, Capt. C. G., R.N...St. Comp, Wrotham, Kent

Ransom, Joshua...Hitchin, Hertfordshire

Ransome, James...Ipswich, Suffolk

Ransome, James Allen...Ipswich, Suffolk

Ransome, Robert...Ipswich, Suffolk

Ranson, John...Sproughton, Ipswich, Suffolk

Raper, Robert...Chichester, Sussex

Raphael, Lewis...Bush Hill Park, Edmonton, Midd.

Rashotham, D...Doddlespool, Newcastle, Staffs.

Rashleigh, Wm., M.P...Monabally, near Fowey, Cornwall

Rason, William...Eastbourne, Sussex

Ratcliffe, Richard...Ingleby, near Derby

Ratcliffe, Wm...Great Brickhill, Fenny Stratford

Ratcliffe, W...Newmarket, Cambridgeshire

Ratford, Isaac...Bronley St, Leonards, Middlesex

Rathbone, Basil...Woodcroft, near Liverpool

Rathbone, Theodore...Allerton Priory, Liverpool

Ravenhill, John...Warminster, Wiltshire

Rawes, John...Thornby Colliery, Durham

Rawlence, G. C...Parsonage, Fordingbridge, Hants.

Rawlance, Jas...Heale, Woodford, Salisbury, Wilts.

Rawlins, George...Leo House, Romsey, Hampshire

Rawling, Robert...Whitchurch, Hampshire

Rawlinson, John...Andover

Rawson, Christ...Hope House, Halifax, Yorkshire

Rawson, James...Holmesierrepoint, Nottinghamsh.

Rawson, Rich...Whesthill, near Liverpool, Lanc.

Rawson, R. W...Statistical Society, 11, Regent St.

Rawsthorne, Thomas...Heysham Hall, Lancaster

Ray, Rev. G. H...Heanor Hall, near Derby

Ray, Henry...Iron-acton, Gloucestershire

Ray, John...Heanor Hall, near Derby

Raymond, S. W...Belchamp Hall, Sudbury, Suffolk

Raynbird, R...Hargrave, Bury St. Edmunds, Suffolk

Rayne, R...Flat's Farm, Bishop Auckland, Durham

Rayner, Henry...Ely, Cambridgeshire

Rayner, W...Ely, Cambridgeshire

Raynes, Michael...Mells Park, Frome

Raynsford, John...Henlow Grange, Biggleswade, Bedfordshire

Rayson, Robert...Stockton-on-Tees, Durham

Rea, G...North Middleton, near Wooler, Northumberland

Read, Alfred...Syleham, Suffolk

Read, John...35, Regent Circus, Piccadilly

Read, John...Derwent Hall, Sheffield

Read, John...Hilrow, Cambridgeshire

Read, J. O. C...Wern, Northop, Flint

Read, Robert...Credition, Devonshire

Read, T. W...Trowse Mills, Norwich, Norfolk

Read, William Edwards...Stretham, Ely, Cambs.

Reade, Rev. Joseph Bancroft...Vicar of Stone, Aylesbury, Buckinghamshire

†Rebow, G...Wivenhoe Park, Colchester, Essex

Redfern, Francis...Manchester

Redfern, Thomas, jun...Barton, near Nottingham

Redfern, William...Middleton, by Youghreave, Bakewell, Derbyshire

Redgate, Thomas B...Nottingham

Redhead, John...Walker, Newcastle-on-Tyne

Reed, John...Hepton, near Thetford, Norfolk

Reed, L...Gaymore, near March, Cambridgeshire

Reed, Nicholas Reed...Byrness, Redesdale, near Jedburgh, N. B.

Reed, T...Warksworth Barns, Ailwick, Northumberland

Rees, John...Flinston, near Pembroke

Rees, Rees Edward...Pantwigocho, near Newport, Monmouthshire

Rees, Richard...Gillifiton, near Swansea

Rees, W. T...Holly House, Newport, Monmouthsh.

Reeve, Major-Gen...Leadenham, Grantham, Lincs.

Reeve, Thomas...Uppingham, Rutlandshire

Reeves, John Fry...Taunton, Somersetshire

Reeves, J. R...Huntland, Crawley Down, Sussex

Relf, Samuel...Ryeigate, Surrey

Remington, Reginald...Stricklandgate, Kendal, Westmoreland

Rendall, George...Quarr Farm, near Hyde, Isle of Wight

Renshaw, James...West Heath House, Eritch, Kent

Renton, John...Orchard Cottage, near Sholey, Newcastle-on-Tyne

Reynardson, Lieut.-Gen. Birch...Holywell Hall, Stamford, Lincolnshire

Reynolds, Joseph...131, Piccadilly

Reynolds, Peter...Kewbenton, Shifnal, Shropshire

Reynolds, Thos...17, Catherine Place, Stoke Croft, Bristol

Reynolds, Dr. William...Allerton, Liverpool

- Rhodes, J. A...Roundbury, near Leeds, Yorkshire
 Ricardo, David....Gatcombe Park, near Minchin-
 hampton, Gloucestershire
 Rice, Edward Royd, M.P....Dane Court, near Wing-
 ham, Kent
 Rice, James...Far Cotton, near Northampton
 Rich, Edmund William....Didmorton, Dunkirk,
 Nailsworth, Gloucestershire
 Rich, Richard Pinneger...Chippenham, Wiltshire
 †Richards, Edward Priest...Cardiff, Glamorganshire
 Richards, Rev. E. T....Farlington, Havant, Hants.
 Richards, Rev. Henry...Horfield, Bristol
 Richards, Jas....Dumbleton, Evesham, Worcestersh.
 Richards, Thomas...The Bunk, Carmarthen
 Richards, W. H....Lea Coombe, Axminster, Devon.
 Richardson, Christoph...Capel, near Dorking, Surrey
 Richardson, James...Burton-upon-Trent, Staffs.
 Richardson, John...Asgarby, Horncastle, Lincolnsh.
 Richardson, John...Burton-upon-Trent, Staffs.
 Richardson, John...Heydan, Reepham, Norfolk
 Richardson, Percival...Horkston, Barton-on-Hum-
 ber, Lincolnshire
 Richardson, Capt. T. W....Suttonhurst, Lewes, Suss.
 Richardson, William...Great Limber, near Brigg,
 Lincolnshire
 Richardson, W....Southampton
 Riches, Thomas Henry...Uxbridge, Middlesex
 Richmond, J...Victoria Bridge, Salford, Manchester
 Rickaby, John...Bridlington Quay, Yorkshire
 Ricketts, H....The Grove, Brislington, near Bristol
 Riddell, Edward...Chesesham Grange, Newcastle-
 on-Tyne
 Riddick, William...Cirencester, Gloucestershire
 Ridge, Thos. John...Hambledon, Horndean, Hants
 Ridge, William...Stoneham, Lewes, Sussex
 Ridley, Rev. Chas. John...University Coll., Oxford
 Ridley, John...Park End, Hexham, Northumberland.
 Ridley, John M...15, Montague Place, Bryanstone
 Square
 Ridley, Samuel...Rindleford, Bridgnorth, Salop
 Ridley, Wm...Felstead, Chelmsford, Essex
 Rigby, Jas...Moss House, West Derby, Liverpool
 Rigby, Robert...Maghull, near Liverpool
 Rigby, Robert...Canterbury Street, Liverpool
 Rigden, William...Hove Farm, near Brighton
 Rigg, Robert...Greenford, Middlesex
 Rigg, Sam...Abbey Holme, near Wigton, Cumberld.
 Riley, Dr...Clifton
 Riley, W. F...Forest Hill, Windsor, Berks.
 Ringer, John...West Harling, near East Harling,
 Norfolk
 Ripley, John...23, Canning Street, Liverpool
 Risley, Rev. W. C...Deddington, Banbury, Oxon
 †River, John...
 Rivers, the Lord...Rushmore Lodge, Woodyates Inn,
 Blandford, Dorsetshire
 Rix, Benjamin...Great Yarmouth, Norfolk
 Rix, Nathaniel...Bowman's Green, Ridge, near St.
 Albans, Herts.
 Roach, John...Penrton, Newport, Isle of Wight
 Roads, John...Ashmore Farm, Middle Claydon,
 Wintow, Beds.
 Roale, J...Bredon Farm, Wiveliscombe, Somerset
 Roberts, Abraham George...Lombard Street
 Robbins, Col. Thos. Wm...Castle Malwood, Stoney
 Cross, Hants
 Robe, Charles...Draycott, near Derby
 Roberts, C...The Quarry, near Stourbridge
 †Roberts, Charles...Barnstaple, Devonshire
 Roberts, Edward...King's Wood, Baldock, Herts.
 Roberts, Geo. W...King's Walden, Hitchin, Herts.
 Roberts, John...Borzele, Tiehurst, near Lamber-
 hurst, Sussex
 Roberts, John...New Hall, Rhuabon, Denbighsh.
 Roberts, M. C. Cramer...Church Cottage, Delgany,
 county Wicklow, Ireland
 Roberts, Owen...Dinas, near Carnarvon, N. W.
 Roberts, Thomas...Ivington Bury, Leominster
 Roberts, William...Hemel Hempstead, Herts.
 Robins, Henry...Asps, near Warwick
 Robins, R. B...East Lavant, near Chichester, Suss.
 Robinson, D...Clitheroe Castle, Clitheroe, Lancash.
 Robinson, F...Frampton, near Boston, Lincolnsh.
 Robinson, George...Wolverhampton, Staffordshire
 Robinson, George...Barton-on-Humber, Lincolnsh.
 Robinson, Sir Geo. S., Bart...Cranford, Kettering,
 Northamptonshire
 Robinson, Jas...Huggart's Farm, Brindle, Chorley,
 Lancashire
 Robinson, J...The Wood, Albrighton, Wolverhampt.
 Robinson, Rev. J...Widmerpool, Melton Mowbray
 Robinson, Rev. J. Banks...Pen Park House, West-
 bury-upon-Trym, Bristol
 Robinson, Michael...Heston, Hounslow, Middlesex
 Robinson, N...Littlebury, Saffron Walden, Essex
 Robinson, Rev. Rich. Barton...Lytham Parsonage,
 Preston, Lancashire
 Robinson, T...Old Bold Hall, Warrington, Lancash.
 Robinson, Thomas...Castle Ashby, Northampton.
 Robinson, Thomas...Oxford Bank
 Robinson, Wm...Albion Place, Hemel-Hempstead,
 Herts.
 Robinson, Wm...Bonehill, Tamworth, Staffs.
 Robinson, W...Abbott Hall, Kendal, Westmoreld.
 Robinson, Wm...Barton-on-Humber, Lincolnsh.
 Robson, John...West Cherton, Newcastle-on-Tyne,
 Northumberland
 Robson, John...Sunnieside, Newcastle-on-Tyne
 Robson, John...East Kleider, Bellingham, Hexham,
 Northumberland
 Robson, Rich...Howick, near Alnwick, Northumb.
 Robson, William...Wilton, near Salisbury
 †Roch, Nicholas...Paskiston, Pembrokeshire
 Rock, James John...Glastonbury, Somersetshire
 †Rodd, F. H...Trebartha Hall, Five Lanes, Cornwall
 Roddam, Joseph...Newton Stanhope, Weardale,
 Durham
 Roddam, Wm...Roddam, Wooler, Northumberland
 Roden, Geo...Sutton Maddock, Shifnal, Salop
 Rodwell, Geo...Burnham Deepdale, Lynn, Norf.
 Rodwell, Joshua...Alanton Hall, Woodbridge, Suff.
 Rodwell, Thos...Choseley, Rougham, Norfolk
 Rodwell, William...Ipswich, Suffolk
 Roe, Freeman...70, Strand
 Roe, Hen. R...Gnaton Hall, Yealmpton, Plymouth,
 Devonshire

- Roe, J. C. . . . Lynmouth, Minehead, North Devon
 Rogers, E. M. . . . Brandon Hall, near Brandon, Suff.
 Rogers, George . . . College Green, Bristol
 Rogers, Hen. . . . Stagenhoe Park, near Welwyn, Herts
 Rogers, John . . . Melchbourn, Bedfordshire
 Rogers, Samuel S. . . . Douglas, Isle of Man
 Rogers, Wm. . . . Iarnold, Bedfordshire
 Rogers, Wm. . . . Iichen Abbas, Winchester, Hants
 Rogers, Wm. . . . Chillington, Bedfordshire
 Rogerson, Jno. . . . 9, Camden Terrace, Camden Town
 Rogerson, Joseph . . . Algerkirk, near Boston, Linc.
 †Rolle, Charles F. N. . . . Sedgford Hall, near Lynn, Norfolk
 Rolfe, John . . . Beaconsfield, Bucks.
 Rolls, Alexander . . . Gibraltar, near Monmouth
 Rolls, John E. W. . . . The Hendre, near Monmouth
 Romilly, Edwd. . . . Porthkerry, Cardiff, Glamorgan.
 Romney, the Earl of . . . Maidstone
 Ronald, Robert . . . Derby
 Ronalds, John . . . Brentford, Middlesex
 Rooke, Maj.-Gen. Sir H. Willoughby . . . Moastern, near Windsor, Berks.
 †Rooper, J. Bonfoy . . . Abbotts Ripton, Hunts.
 Rootes, Chas. Fred. . . . Castler End, Ross, Hereford.
 Roper, John . . . Foscott, near Buckingham
 Roper, Wm. . . . Bayham, Lamberhurst, Sussex
 Roscoe, James . . . Knutsford, Cheshire
 Roskrige, John, jun. . . . Roskrige St. Anthony, Helston, Cornwall
 Ross, James . . . Dibden, near Southampton
 Ross, Wm. . . . Fobdown, near Alresford, Hants.
 Rossmore, Lord . . . The Dell, Windsor, Berks.
 Rotch, Thomas D. . . . Dratmanford House, Newton Stewart, N. B.
 †Rothwell, Rich. Rainshaw . . . Preston, Lancashire
 Round, C. G. . . . M.P. . . . Birch Hall, Colchester, Essex
 Round, George . . . Colchester, Essex
 Round, J. . . . M.P. . . . Danbury Park, Chelmsford, Essex
 †Rous, Rev. George . . . Laverton, Bath
 Rous, T. B. . . . Courtyrall, Cardiff, Glamorganshire
 Rous, Hen. Wm. Rufus . . . Worstead House, Norwich, Norfolk
 Row, Wm. N. . . . Cove, near Tiverton, Devonshire
 Rowe, Samuel . . . Malpas, Cheshire
 Rowe, Wm. Wevill . . . Heat Hay, Tavistock, Devon.
 Rowbottom, John . . . Heage, near Belper, Derbysh.
 †Rowland, Richard . . . Creslow, Aylesbury, Bucks.
 Rowland, Wm. . . . Water Eaton, near Oxford
 Rowland, W. . . . Rambury, near Hungerford, Berks.
 Rowlett, Thos. . . . Walkern Place, Stevenage, Herts.
 Rowles, Chas. . . . Ledwell Farm, Woodstock, Oxon
 Rowley, George W. . . . St. Neots, Hunts
 Rowley, John G. . . . Sunning Hill, Chertsey, Surrey
 Rowley, R. C. . . . East Bergholt, Colchester, Essex
 Royce, John . . . Boxted Hall, Colchester, Essex
 Royston, J. C., sen. . . . Codnor Park, Alfreton, Derby.
 Royston, J. C., jun. . . . Codnor Park, Alfreton, Derby.
 Ruak, Edmund . . . Down Ampney, Cricklade, Wilts.
 Ruck, Lawrence . . . Pantludw, Machynlleth, Aberystwyth
 Ruddle, G. . . . Walton Hall, Tewkesbury, Gloucestershire
 Rudgard, Edward . . . Lincoln
 Rudd, Rev. G. T. . . . Worsell Hall, Yarm, Yorkshire
 Rudkin, John Charles . . . Derby
 †Rumbold, Charles E., M.P. . . . Preston Candover, Basingstoke, Hants
 Rusbridger, Geo. . . . Goodwood, Chichester, Sussex
 Rusbridger, John . . . Goodwood, Chichester, Sussex
 Rusbridger, Rev. J. . . . Goodwood, Chichester, Sussex
 †Rushout, Capt. (1st Life Guards) . . . Athenaeum Club
 Russ, J. Harry . . . Castle Cary, Somersetshire
 Russell, Chas. Henry . . . 9, Royal Well Terrace, Cheltenham, Gloucestershire
 †Russell, Lord Charles J. F. . . . Drakeloe Lodge, Woburn, Bedfordshire
 Russell, David . . . York
 Russell, G. L. . . . 4, Mansfield St., Cavendish Square
 Russell, Thos. A. . . . Cheshunt Park, Waltham Cross, Herts
 †Russell, Sir Willm. . . . Charlton Park, Cheltenham, Gloucestershire
 Russen, Joseph . . . Stoke Prior, Bromsgrove, Worcestershire
 Rust, James . . . Alconbury, near Huntingdon
 Rutley, Saml. . . . Wrotham, Kent
 Rutson, Wm. . . . Newby Wisk, Northallerton, Yorksh.
 Ryecroft, Sir Richd. H. C. . . . Marydown Park, Basingstoke, Hants.
 Rylatt, W. . . . Branswell, Sleaford, Lincolnshire
 Saberton, Thos. . . . Witcham, Ely, Cambridgeshire
 Saberton, William . . . Ely, Cambridgeshire
 Sabin, John . . . Harbury, Southam, Warwickshire
 Sadler, H. . . . Mid-Lavent, Chichester, Sussex
 Sadler, Isaac . . . Houghton Down Farm, Stockbridge, Hampshire
 Sadler, Wm. . . . Messing Kelvedon, Essex
 Sadler, Wm. Ford . . . Derby
 Sadler, Wm. J. . . . Purton, Swindon, Wilts.
 Sager, R. . . . Seabton Park, Suffolk
 Sainsbury, George Taylor . . . Devizes
 Sainsbury, Wm. . . . Manor House, West Lavington, Devizes, Wilts.
 †St. Albans, Duke of . . . Redbourne Hall, Brigg, Lincolnshire
 St. Aubyn, Rev. H. M. . . . Clowance, Camborne, Cornwall
 St. John, Lord . . . Melchbourne, Kimbolton, Hants.
 St. Quintin, T. . . . Hatley Park, Biggleswade, Beds.
 St. Vincent, Viscount . . . Meaford, Stone, Staffs.
 Salisbury, Wm. . . . Dorden, nr. Atherstone, Warwicksh.
 Sallows, Henry . . . Kate's Hill, Hadleigh, Suffolk
 Salmon, John . . . Berkeley Square, Bristol
 Salmon, P. . . . Luffield Abbey, near Stowe, Bucks
 Salmon, W. . . . Park Fields, near Stowe, Bucks
 Salomons, Daniel . . . Broom Hill, Tonbridge, Kent
 Salter, Geo. . . . Combe Farm, Crewkerne, Somerset.
 Salter, F. . . . Gt. Hallingbury, near Bishop's Cleeve, Herts.
 Salter, Thomas . . . Attleborough, Norfolk
 Salter, W. P. . . . Whinberg, East Dereham, Norfolk
 Salusbury, Sir John . . . Liverpool
 Salvin, Gerard . . . Croxdale, Durham
 Salvin, Marmaduke Chas. . . . Burnhall, near Durham
 Samman, W. . . . Middleton Park, near Bicester, Oxon

- Sampey, Henry...Hawton, Newark, Notts.
 Sampson, Arthur...Drummond, Ballykelly, Derry, Ireland
 Sampson, John...Brympton, near Yeovil, Somerset
 Samson, Henry...Oakham, Rutlandshire
 Samson, T...Kingston Russell, Dorchester, Dorset
 Sanday, W...Holme Pierrepont, Nottinghamshire
 †Sandbach, Hy. R....Hafodunos, Abergelge, Denbighshire
 †Sandbach, Saml., sen...Woodland, near Liverpool
 †Sandbach, Saml., jun...Woodland, near Liverpool
 Sanders, E. A...Stoke House, near Exeter, Devon
 Sanders, Henry...Harleston, near Northampton
 Sanders, John...High Street, Bedford
 Sanders, Joseph...Liverpool
 Sanders, Samuel...Fernhill, Newport, Isle of Wight
 Sanders, Samuel...Lockers, Hemel Hempstead
 Sanders, Thomas...Hanbury, Worcestershire
 Sanderson, George...Mansfield, Nottinghamshire
 Sandford, Mark...Martin, East Langdon, Walmer, Kent
 Sandford, T. H...Sandford Hall, Whitechurch, Salop
 Sandham, Major...Rowdell, Steyning, Sussex
 Sandie, Joseph...North Ockendon, Romford, Essex
 Sandie, Wm...Withersfield Place, Baintree, Essex
 Sandie, Wm...North Ockendon, Romford, Essex
 Sandon, Viscount, M.P...Norton House, Campden, Essex
 Sandwich, Earl of...Hinchinbroke House, Hunts.
 Sandford, W. A...Nynehead Court, Wellington, Somersetshire
 Sergeant, John...Haslingfield, Cambridgeshire
 Sergeant, John...Aldermanston Cottage, Shipston-on-Stour, Warwickshire
 Sergeant, Rev. John...Stanwick, Higham Ferrers, Northamptonshire
 Sarney, Edw...Soundness, Nettlebed, Henley, Oxon
 †Satterfield, Joshua...Green Keys, Manchester
 Saul, Wm...High Ferry, Sibsey, Boston, Lincolnsh.
 Saunders, John E...Glanrhyd, near Carmarthen, S. Wales
 Saunders, E. W...Nunwick Hall, Penrith, Cumberland
 †Saunders, Thos. B...16, Brompton Square
 Saunders, Thos...Brightwell, Tetworth, Oxon
 Savage, Francis...Springfield, Westbury-on-Trym, Bristol, Somersetshire
 Savage, Francis, jun...Henleys, near Bristol
 Savage, Thomas...Dunsley, Stourbridge
 Seville, Albany B...Oaklands, Okehampton, Devon
 Seville, John...St. Neot's, Hunts
 Savill, Robt. M...Colchester, Essex
 Savours, William...Headington, Oxford
 Sawbridge, Hy. Barne...East Haddon, near Northampton
 Sayers, John...Oriental Club, Hanover Square
 Saxby, John...North-east, Lewes, Sussex
 Saxon, John...Green's Combe, Bruton, Somerset
 Saxon, Samuel...Green's Combe, Bruton, Somerset
 Sayce, Morris...Kington, Herefordshire
 Sayer, Robt...Sibton Park, near Yorkford, Suffolk
 Sayer, John...Field-Dalling, near Holt, Norfolk
 Seale, Edw...Dowsby, Fellingham, Lincolnshire
 Seales, John....Agricultural College, Cirencester, Gloucestershire
 Sear, Ed...Westside House, Darlington, Durham
 Sear, Jonathan...Shrewsbury, Salop
 Sear, Thos. F...Keverstone, Darlington, Durham
 Sear, Wm. T...Keverstone, Darlington, Durham
 Seardsale, Lord...Kedleston Hall, near Derby
 Scholes, Richard...Aigburth Hill, near Liverpool
 Sclater, Wm. Lutley...Hoddington House, Oditham, Hampshire
 Scobell, John...Nancealverne, Penzance, Cornwall
 Scobell, Captain George T...High Littleton, near Bath, Somersetshire
 Scobell, J. Ustick...Mintvale House, Farrington Gurney, near Bath, Somersetshire
 Scorer, M...Scarcliffe, near Chesterfield, Derbyshire
 Scotson, Saml...Toxteth Park, Liverpool, Lanc.
 Scott, Sir Edw., Bart...Great Barr Hall, Birmingham
 Scott, G. D...Lovel Hill, Winkfield, Windsor, Berks.
 Scott, Geo. G...Edenham, Bourn, Lincolnshire
 Scott, Lord John...Cawston Lodge, Dunchurch, Warwickshire
 Scott, John...Tixall, near Stafford
 Scott, John...Baron Hill, Beaumaris
 Scott, Joseph...Colney Hall, Norwich, Norfolk
 Scott, M. J...Keisby, Fellingham, Lincolnshire
 Scott, Thomas...Beal, near Belford
 Scott, Thos. Edw...Carbrook, Watton, Norfolk
 Scott, Wm...Keisby, Fellingham, Lincolnshire
 Scott, Wm...Winterton, Brigg, Lincolnshire
 Scratton, D. R...Pittville Priory, Rochford, Essex
 Scriven, George...Castle Ashby, Northampton
 Scruby, Wm...Broxted, Dunmow, Essex
 Scudamore, Lieut.-Colonel...Kentschurch Court, near Hereford
 Seaman, B. C. P...Rotherly, Melton Mowbray, Leicestershire
 Seamark, Richd...Mount St. Albans, near Caerleon, Monmouthshire
 Searby, Robt...Croft, near Wainfleet, Lincolnshire
 Searle, Wm...Sardes, Chipping Norton, Oxon
 Seaton, R...Cramnon Lodge, Deeping St. James's, Market Deeping, Lincolnshire
 Seaton, Charles...Waverley, near Liverpool
 Seawell, T. S...Marelands, near Farnham, Surrey
 Sedgwick, John...Harpsden, Henley, Oxon
 Selby, Frideaux...Bradley Hall, Lancashire
 Selmes, Jas...Tufton Place, Northiam, Rye, Sussex
 Selmes, James...Lea, Rye, Sussex
 Selmes, Samuel...Beckley, Rye, Sussex
 Senior, J. T...Broughton House, Aylesbury, Bucks.
 Senhouse, Captain Wm...Ashby St. Ledgers, Daventry, Northamptonshire
 Seppings, Edward...Swaffham, Norfolk
 Severne, Thomas...Newent, Gloucestershire
 Severs, Leonard...Oliver, Richmond, Yorkshire
 Seward, Samuel...Weston, Petersfield, Hampshire
 Sewell, John...Caldecote, near Swaffham, Norfolk
 Sewell, Joseph...Cirencester, Gloucestershire
 Sewell, Robt. B...Newport, Isle of Wight
 Sewell, Professor Wm...Royal Veterinary College, St. Pancras
 Sewell, Russell...Little Oakley Hall, Harwich, Essex

- Sewell, Rev. Thomas...Pusey, near Faringdon
 Sewell, Thomas Francis...Colne Engain, Essex
 †Seymer, K. H...Hanford, Blandford, Dorset
 Seymour, Sir Geo. Francis...The Palace, Hampton Court, Middlesex
 Seys, William Æneas...Tutshill, near Chepstow, Monmouthshire
 Shackel, Geo...Maple-Durham, Reading, Berkshire
 Shackel, Wm...Early Court, Reading, Berkshire
 Shafto, R. E. Duncombe...Whitworth Park, Ruslyford, Bishop's Auckland, Durham
 Shafto, Rev. S. Duncombe...Rector of Buckworth, Huntingdonshire
 Shafto, Thomas Duncombe...Whitworth Park, Bishop's Auckland, Durham
 Shakewear, Thomas...Bromsberrow Court, Ledbury, Herefordshire
 Shand, Alexander...Rupert House, near Liverpool
 Shasman, Alexander...Bedford
 Sharman, John W...Wellingborough, Northampton
 Sharpe, Jas...Fawley-Court Farm, Henley, Oxon
 Sharp, Joel...Pinchbeck, Spalding, Lincolnshire
 Sharwood, Denny...120, Aldersgate Street
 Shaw, Francis...Wirksworth, Derbyshire
 Shaw, Richard...Newhaven House, near Ashbourne, Derbyshire
 Shaw, Thomas...Everton, Liverpool
 Shaw, William...Cold Norton, Stone, Staffordshire
 Shaw, William...Great Hotel, Buxton, Derbyshire
 Shaw, William, jun...Far Cotton, Northampton
 †Shawe, R. F...Brantingham Hall, Hull, Yorkshire
 Shawe, R. N...Keegrave Hall, Woodbridge, Suffolk
 Shawe, Samuel P...Hills Hall, Tamworth, Staffs.
 Shearer, Bettesworth Pitt...Swanmere House, Bishop's Waltham, Hampshire
 Shearm, Edward...Stratton, Cornwall
 Sheddon, Col...The Elms, Lyvington, Hampshire
 †Sheild, W. II...Landhawke, Langhorne, Carmar.
 †Sheldon, Jonathan...Ensham, near Oxford
 Sheldon, William...Stanton, St. John, Oxford
 Sheldon, Wm...Stratford-upon-Avon, Warwickshire
 Sheffield, Sir Robert, Bart...Normanby, Brigg, Linc.
 Shelley, John...Springfield, Ilorsham, Sussex
 Shelley, J. V...Maresfield Park, Uckfield, Sussex
 Shepherd, Arthur...Shaw End, Kendal, Westmorel.
 Shepherd, Capt. John...Holly Lodge, Walton-on-Thames, Surrey
 Shepherd, Julius Gaborian...Faversham, Kent
 †Sheppard, Joseph...Horton Lodge, Shrewsbury
 Sheppard, Sir Thomas Cotton, Bart...Crahmarsh Hall, Uttoxeter, Staffordshire
 †Sherard, P. Castel...Glanton, Stilton, Hunts.
 Sheraton, William...Ellesmere, Shropshire
 Sherborn, Francis...Bedfont, Middlesex
 Sherborne, Mathew...Heston, Hounslow, Middlesex
 †Sherratt, John Simpson...Lichfield, Staffordshire
 Sherring, Ed...Milborne, Sherborne, Dorsetshire
 Sherring, John...Milborne Wick, near Wincanton, Somersetshire
 Sherwin, J. S...Bramcote Hills, Nottinghamshire
 Sherwood, J...Furley, near Reading, Berkshire
 Sherwood, Richard...Chaddlesworth, near Wantage, Berkshire
 Sherwood, William...Abbotts, Langley, Herts.
 Shilcock, T. Beaumont...Rose Hall, near Melton Mowbray, Leicestershire
 Shillito, Stephen J...Barrow Hall, Bury St. Edmunds, Suffolk
 Shipman, William...Sedgebrooke, Grantham, Linc.
 Shirley, Henry...Ham Court, Upton-upon-Severn
 Shittler, John...Bradford Farm, Wimborne, Dorset.
 Shorland, John, jun...Dundry Grove, near Bristol
 Short, Francis...Abbot's Leigh, Bristol
 Short, Henry...Bersick-upon-Tweed
 Short, T...Martin, near Bawtry, Nottinghamshire
 Shrubh, James...Dorchester, Dorsetshire
 †Shubrick, Col...The Grove, Leatherhead, Surrey
 Shuldham, Wm. L...Dummanway, Cork, Ireland
 Shute, Henry...Winterbourne, Bristol
 Shute, Robert...Liverpool
 †Shuter, James...Kintbury, Newbury, Berkshire
 Shuter, T. A...Hooley House, Coulsdon, Croydon, Surrey
 Shuttleworth, John Spencer A...Hathersage, near Bakewell, Derbyshire
 Shuttleworth, G. E...Tottenham Green, Middlesex
 Shuttleworth, Mark H...Tottenham, Middlesex
 Sibley, R...Kingsborne Green, Harpenden, near St. Albans, Hertfordshire
 Sidebotham, E. H...Ashley Cottage, Atteringham, Manchester, Cheshire
 Sidford, George...Bishopstone, Wilton, Wiltshire
 Sidford, John...Bishopstone, Salisbury, Wiltshire
 Sillar, Z...Rainford Hall, near Prescott, Lancashire
 Silvertop, G...Minsteracies, Newcastle, Northumberland
 Simeon, Sir Rich., Bart...Swainston, Isle of Wight
 Simon, James...Greenfield, Holywell, Flintshire
 Simonds, Jas. B...9, Gt. College St, Camden Town
 Simonds, W. Barrow...St. Cross, near Winchester
 Simmonds, Henry...Headlow, Tonbridge, Kent
 Simmonds, P. L...18, Cornhill
 Simons, Charles...Fishtoft, near Boston, Lincolnsh.
 Simpson, Frederick...Spondon, near Derby
 Simpson, Henry B, jun...Eaton, Retford, Notts.
 Simpson, James Blyth...St. Mary Gate, Derby
 †Simpson, Hon. John B...Babworth Hall, Retford, Nottinghamshire
 Simpson, John...Pyle, Glamorganshire
 Simpson, John...Wyken Hall, Bardwell, Ixworth
 Simpson, Rich...The Cliffs, Douglas, Isle of Man
 Simpson, William...24, Savile Row
 Simpson, Rev. W. B...Babworth, Retford, Notts.
 Simpson, W. W...s, Montague Place, Russell Sq.
 Sinclair, Archib...Hill Side House, near Liverpool
 Sison, John...Plascock, St. Asaph, Flintshire
 Sitwell, Chas. John...Stainesby House, near Derby
 Sitwell, Edward Degge...Stainesby, Derby
 Sitwell, Sir G...Benisham, Chesterfield, Derbyshire
 Sitwell, Rev. H. W...Dunchurch, Southam, Warwickshire
 Sitwell, Robert Sacheverell...Merley, near Derby
 Skelton, Edward...Sutton, near Long Sutton, Wisbeach, Cambridgeshire
 Skelton, S...Sutton Bridge, Wisbeach, Cambridgesh.
 Skelton, W...Long Sutton, Wisbeach, Cambridgesh.

- Skingley, Henry Wake's Hall, Wake's Colne, Colchester, Essex
- Skingley, Samuel... Coggeshall, Essex
- Skipwith, Sir Gray, Bart... Newbold Hall, Brinklow, Rugby, Warwickshire
- Skirving, William... Queen Square, Liverpool
- Skyunner, Rev. William... Rushden Vicarage, near Runtingford, Hertfordshire
- Slack, Joseph A... 32, Weymouth St., Portland Pl.
- Sladden, Isaac... Herne, Canterbury, Kent
- Slaney, W. Henry... Hatton Grange, Shifnal, Salop
- Slapp, Rev. Thos. Peyton... Old Buckenham Lodge, Attleborough, Norfolk
- Slark, William... 155, Piccadilly
- Slater, John... Cammeringham, near Lincoln
- Slater, John... Shottle, Belper, Derby
- Slater, J. J., jun... Haslebeach, Market Harborough
- Slater, M... Weston Colville, Newmarket, Cambs.
- Slater, Samuel... North Carlton, Lincoln
- Slater, Edward... Preston, Wingham, Kent
- Slatter, Thos... Park Farm, Fairford, Gloucestershire
- Slatter, W... Stratton, near Cirencester, Gloucestersh.
- Slingsby, James... Everton, near Liverpool
- Small, Harry... Barfoot Farm, Wimborne, Dorset.
- Smallbones, G. Bromfield... Inspector of Estates of Prince Esterhazy, Hungary
- Smalley, Francis... Toton, Nottingham
- Smallpiece, John... Leith Hill Place, near Dorking, Surrey
- Smallpiece, Job... Compton, Guildford
- Smallpiece, Mark... Dorking, Surrey
- Smallpiece, William Haydon... Guildford
- Smallwood, John... Tower Hill, near Birmingham
- Smart, Charles J... Rainham, Sittingbourne, Kent
- Smart, Capt. George John... Tumbly, near Boston
- Smart, William... Rainham, Sittingbourne, Kent
- Smart, William... Pig-tree Court, Temple
- Smart, William Lynn... Lenden, Woburn
- Smeddle, William... Ordnance Office, Tower
- Smeeton, S... Sibbertoft, Market Harborough, Leic.
- Smith, Alexander... Cirencester, Gloucestershire
- Smith, Alfred... Derby
- Smith, Rev. A... Old Park, near Devizes, Wiltshire
- Smith, Augustus... Ashlyns Hall, Berkhamstead
- Smith, Benjamin, M.P... Hastings, Sussex
- Smith, Benjamin... Duckmanton Lodge, near Chesterfield, Derbyshire
- Smith, Benjamin... Colebrook Park, Tonbridge
- Smith, Charles Brent... Whaddon, near Gloucester
- Smith, Charles Culling... 22, Arlington Street
- Smith, Charles H... Gwconllwynnyth, near Swansea, S. W.
- Smith, C. R... Southrop House, Fairford, Gloucestersh.
- Smith, Chas. Robert... Collingbourne Ducis, Marlborough, Wiltshire
- Smith, C... Burley-on-the-Hill, Oakham, Rutlandsh.
- Smith, Sir Culling Eardly, Bart... Bedwell Park, near Hatfield, Hertfordshire
- Smith, Edward... Charlbury, Enstone, Oxon
- Smith, Edward Osborne... 55, Old Broad Street
- Smith, E. W... Routh, Beverley, Yorkshire
- Smith, Francis... Salthill, near Chichester, Sussex
- † Smith, George... The Loham, near Penrith, Cumb.
- Smith, G... Kirkby Underwood, Folkingham, Linc.
- Smith, George... Potton, Biggleswade, Bedfordshire
- Smith, G. Robert... Snelsden, near Croydon, Surrey
- Smith, Henry Abel... Wilford, Nottingham
- Smith, Henry... Drax Abbey, Selby, York
- Smith, H... Heywood Farm, Waltham, Maidenhead
- Smith, James... Stansted, near Chichester, Sussex
- Smith, James... Deanston, Perth, N. B.
- Smith, Jeremiah... Springfield, Rye, Sussex
- † Smith, John... Welton Garth, Hull, Yorkshire
- Smith, John... Roughton, Wolverhampton, Staffs.
- Smith, John... Spring Fields, Newcastle, Staffs.
- Smith, John... Barton House, Ashbourne, Derbysh.
- Smith, John... Branceykneth, Durham
- Smith, John... Lewes, Sussex
- Smith, John... Weyhill, Andover, Hampshire
- Smith, John... Ozeby, Grantham, Lincolnshire
- Smith, John... Redland, Bristol
- † Smith, John J... Down House, Blandford, Dorset.
- Smith, John K... Radbrook Villa, near Shrewsbury
- Smith, John George... Crediton, Devon
- Smith, J. P... Lower Wick House, near Worcester
- Smith, John Samuel... Norton, Shifnal, Salop
- Smith, Rev. John Tetley... Repton, near Derby
- Smith, Sir John Wyldebore, Bart... Down House, Blandford, Dorsetshire
- Smith, Joseph... Chatteris, Cambridgeshire
- Smith, Nath... Horsham, Martley, near Worcester
- Smith, P. B... Taywick, Great Clacton, Colchester, Essex
- Smith, Rich... Marton Lodge, Bridlington, Yorksh.
- Smith, Richard... Foremarck Park, Derby
- Smith, Rich... Upper Hall, Droitwich, Worcestersh.
- Smith, R. B... Huxley Farm, Edmonton, Middlesex
- Smith, Richard Wycherley... Wem, Salop
- Smith, Robert... Heath Farm, St. Albans, Herts.
- Smith, R... Burley-on-the-Hill, Oakham, Rutlandsh.
- Smith, Robert... Acastor Malbis, near York
- Smith, Hon. Rob. Vernon, M.P... Farming Wood, near Thrapstone, Northamptonshire
- Smith, Rev. Roger... Arlsey, near Hitchin, Herts.
- Smith, Rev. Sam. Colley... Denver Rectory, Downham, Norfolk
- Smith, Samuel Steedman... Hopton Castle, Ludlow
- Smith, Spencer... Brooklands, Southampton
- Smith, Thomas, jun... Chillingham Barns, Woker, Northumberland
- Smith, Thos... Blore Hall, Ashbourne, Derbyshire
- Smith, Thomas... Madeley, Shifnal, Salop
- Smith, Thomas... Shareshill, Wolverhampton, Staffs.
- Smith, Thomas... Reigate Lodge, Surrey
- Smith, T. Deacon... Streatley Luton, Bedfordshire
- Smith, T. Hogan... Forberry Grove, near Newbury, Berkshire
- Smith, T. Nicklin... Anstry, near Tamworth, Staffs.
- Smith, T. W... Greenfield Lodge, Oswestry
- Smith, Sir W., Bart... Bardiston House, near Worcester
- Smith, William... Hemel Hempstead, Herts.
- Smith, William... Roughton, Wolverhampton
- Smith, William... West Rasen, Spital, Lincolnshire
- Smith, William... Rushford, Alcester, Warwickshire
- Smith, William... Sion Villa, Shrewsbury

- Smith, W... Barton More, Bury St. Edmunds, Suff.
 Smith, William... Gaydon, Kineton, Warwickshire
 Smith, W... Whitlesay, Peterborough, Northamptonsh.
 Smith, William... Lilleshall, Shifnal, Shropshire
 Smith, W. C... Shortgrove, near Saffron Walden, Essex
 Smith, W. T... Breton Lodge, Rugeley, Staffordshire
 Smithers, Sidney... Churchdale, Bakewell, Derbysh.
 Smyth, James... Peasenhall, Yoxford, Suffolk
 †Smyth, John G... Heath Hall, Wakefield, Yorksh.
 Smyth, Rev. Wm... South Elkinstone, Louth, Linc.
 Smythe, Sir E., Bart... Acton Burnell, Shrewsbury
 Smythies, Carleton... Oak Lawn, Eye, Suffolk
 †Smythies, G... Bickerstaffe Hall, Ormskirk, Lanc.
 Smythies, Rev. J. R... Grey Friars, Colchester, Essex
 †Snell, John F... Hundon, near Clare, Suffolk
 Sneyd, Rev. John... Basford, Leek, Staffordshire
 Snelson, Richard... Bakewell, Derbyshire
 †Snoulton, Osborne... Hiern Hill, Faversham, Kent
 Snow, Benjamin... Sleford, Lincolnshire
 Snow, Johnson... Ewerby, near Sleford, Lincolnsh.
 Snowball, Joseph... Netherwiton, near Morpeth
 Solly, Samuel... 48, Upper Gower Street
 Solly, S. R... Serge Hill, St. Albans, Hertfordshire
 Somerset, John... East Wick, Pewsey, Wilts.
 †Somerville, J. C... Dinder House, Wells, Somerset.
 Soames, Samuel... Wollaston, near Wellingborough, Northamptonshire
 Souby, Robt... Skendleby, Spilsby, Lincolnshire
 Souter, Geo... Box Grove, near Chichester, Sussex
 Southampton, Lord... Whittlebury Lodge, Towcester
 Sowdon, T... Woolhope, near Hereford
 Spanham, James... Blakeney, Norfolk
 †Sparks, Wm... Crewkerne, Somersetshire
 Sparrow, Stephen... Cambridge
 Spear, William... Totton, near Southampton
 Spearing, Jno. B... Chilton, near Hungerford, Berks.
 Spearman, H. J... Newton Hall, Durham
 Speke, William... Jordans, Limsiter, Somersetshire
 Spencer, Rev. I... The Plantation, Acomb, near York
 Spencer, F... Claybrooke, Lutterworth, Leicestersh.
 †Spencer, Hon. F. G... 9, King Street, St. James's
 Spencer, Griffin... Alfreton, Derbyshire
 Spencer, John... Bishop's Lodge, Wrotham, Kent
 Spencer, John... Leekford, Stockbridge, Hants
 Spencer, Jno... Odstone Hall, Measham, near Ashby-de-la-Zouch, Leicestershire
 Spurling, H. P... Norbury Park, Leatherhead, Surrey
 Spizer, John Wm... Escher Place, Escher, near Guildford, Surrey
 Spizer, Thos... Brockhampton, Lambourne, Berks.
 Sporg, A... Manor Farm, Frindsbury, Rochester
 Spooner, Prof. Chas... Royal Veterinary College
 Spooner, L. H... Dromenage, Iwer Heath, Bucks.
 Spooner, Richard... Brickfields, Worcester
 Spooner, William C... Southampton, Hants
 Spoor, Richard... Whitburn, near Sunderland
 Spraggett, Richard... Southam, Warwickshire
 Spraggon, Mark... Nafferton, Newcastle-on-Tyne, Northumberland
 Springett, Robt... Finchcoax, Goudhurst, Tunbridge, Kent
 Spurgin, Dr... Orplands, Bratwell, Essex
 Spurling, John... Shotley, Ipswich, Suffolk
 Spurr, Jeremiah... Wigthorpe, near Worksop, Notts.
 Squire, John Burder... Cross Hall, St. Neots, Hunts.
 Squire, William... Yarmouth, Isle of Wight
 Stable, R. S... Willesby, Cranbrook, Kent
 Stace, William... Berwick, Lewes, Sussex
 Stacey, George... Uxbridge, Middlesex
 Stacy, Wm... Barton Farm, Abingdon, Berkshire
 Staffurth, Samuel... Ramsey, Huntingdonshire
 Staffurth, William... Ramsey, Huntingdonshire
 Stagg, Thomas... Grafton Farm, Burbage, Wilts.
 Stainton, John... Dalby, Spilsby, Lincolnshire
 Staley, Jno... Thorntree Inn, Ripley, near Alfreton, Derbyshire
 Stallard, Joseph... Redmarley, near Gloucester
 Stallard, William... Blankets, near Worcester
 Stammers, J. B... Holywell Cottage, St. Albans
 Stanbrough, Chas. H... Isleworth, Middlesex
 Stanbrough, James... Isleworth, Middlesex
 Stane, Rev. J. Bramston... Forest Hall, Ongar, Essex
 Stanhope, H. E. C. S... Holme, Lacy, Hereford
 †Stanhope, J. B... Revesby Abbey, Horncastle, Lincs.
 Stainer, Chas... Uppington, Wellington, Shropshire
 Stainer, Edw... Wroxeter, Shrewsbury, Shropshire
 Stainer, Jno... Leaton, near Wellington, Shropshire
 Standley, George... Swinfen, near Lichfield, Staffs.
 Staniford, Rev. Thos... Bolton Rectory, Skipton, Yorkshire
 Stanley, Chas... Denhall, Neston, Cheshire
 Stanley, Edward... 14, Grosvenor Square
 Stanley, Wm. Hans Sloane, jun... 21, Curzon Street, May Fair
 Stanley, Sir W. Massey, Bart... Hooton, near Chester
 Stant, Joseph... Shrewsbury
 Stanton, W. H... Stroud, Gloucestershire
 Stanway, J. Holt... Brookfield, Manchester
 Staples, Browns R. T... Launton, Bicester, Oxon
 Stapleton, V... Stow Gate, Market Deeping, Lincs.
 Stapylton, Rev. Martin...
 Stares, Geo. Henry... Bishop's Waltham, Hants
 Starling, Robert... 33, Norfolk Street, Islington
 Starr, John... Eastbourne, Sussex
 Statham, Rev. R. J... Rector of Tarporley, Cheshire
 Statler, Thomas... Knowsley Hall, Lancashire
 Staunton, J... Tidmington, near Shipston-on-Stour
 Staunton, Rev. Dr... Staunton Hall, Grantham, Lincolnshire
 Stavordale, Lord... Melbury, Dorchester, Dorsetshire
 Stead, W. Pitt... Woodley House, Romsey, Hants
 Stedman, Dudley... Horsham, Sussex
 Stedman, John... Goldhanger, Maldon, Essex
 Stedman, Robt... Pakenham, Ipswich, Suffolk
 Stedman, Robt... Great Bookham, near Leatherhead, Surrey
 Steadman, Edward... High Errol, Wellington, Salop
 Steele, John... Epsom, Surrey
 Steele, John... Utting, near Witham, Essex
 Steele, Wm... Abergavenny, Monmouthshire
 Steere, Lee... Tays, Ockley, Surrey
 Stenning, Edw... Godstone, Surrey
 Stenning, Wm... Godstone, Surrey
 Stenning, Wm... Halsford, East Grinstead, Sussex
 Stent, Bridger... Hastings

- Stephens, Evan...Berton, St. Ismaels, near Carmarthen
- Stephens, Rev. F...49, Baker Street, Portman Sq.
- Stephens, John...Caversham, Reading
- Stephens, J...The Abbynes, near Bridgenorth, Salop
- Stephens, J...8, Caroline Place, Mecklenburg Square
- Stephens, Rev. M. F. Townsend...Thornbury, near Bristol, Gloucestershire
- Stephens, Thos...Atherstone, Ilminster, Somerset
- Stephens, Wm...Prospect Hill, Reading, Berks
- Stephens, Rev. W. Wilkin...Southfield, near Southborough, Tonbridge Wells, Kent
- Stephens, W. V...19, Pembroke Square, Kensington
- Stephenson, George...Tipton House, near Chesterfield, Derbyshire
- Stephenson, M...Fourstones, Hexham, Northumb.
- Stephenson, Wm...Throckley, Newcastle-on-Tyne
- Stevens, H...The Shaws House, Matlock, Derbysh.
- Stevens, Hy. Isaac...Derby
- Stevens, James H...Barnage House, Lidney, Forest of Dean, Gloucestershire
- Stevens, John...Bresson, near Derby
- Stevenson, J. G...Skellingthorpe, near Lincoln
- †Steward, Chas...Blundeston, Lowestoft, Suffolk
- Steward, Rev. F...Barking Rectory, Needham, Suff.
- Stickney, Wm...Ridgmont, Hull, Yorkshire
- Stiles, Chas...Strubby, near Alford, Lincolnshire
- Stiles, Thos...Pinchbeck, Spalding, Lincolnshire
- Stilwell, James...Walton-on-Thames, Surrey
- Stobart, S...Hexham Abbey, Hexham, Northumb.
- Stockley, J...Ivetsey Farm, Weston, Shifnal, Salop
- Stokes, Chas...Kingston, Kegworth, near Derby
- Stokes, John...Woburn Park, Chertsey, Surrey
- Stokes, J. A...Harvington, near Evesham, Worcester.
- Stokes, Jonathan...Stamford Rivers, Romford, Essex
- Stokes, S. Callicott...Kinton Hall, Chisbury, Salop
- Stokes, Thos...Wilford Place, Leicester
- Stokes, Thos...Hemscastle, Tenby, Pembrokeshire
- Stone, Geo...North Fawley, near Wantage, Berks.
- Stone, Geo...Fyfield Wick, near Abingdon, Berks
- Stone, John...Summerhill, Bristol
- Stone, Joseph...Dorchester, Dorsetshire
- Stone, Nathaniel C...Rowley Fields, Leicester
- Stone, Richard...Kirby, Colchester, Essex
- Stone, Richard...Trinton Hall, Colchester, Essex
- Stone, R...Kinderton Hall, Middlewick, Cheshire
- Stone, Thos...Barrow, Loughborough, Leicestershire
- Stone, Wm...Stone Bridge, Framfield, Uckfield, Suss.
- Stone, W. F. L...Brightwell, near Watlington, Oxon
- Storey, Chas...Short Hill, Nottingham
- Storey, Rev. J...Hawthorn, near Newark, Notts.
- Storey, R...Beamly, near Alnwick, Northumberland
- Story, Jas. B...Lockington Hall, Derby
- Story, William...Shrewsbury
- Stott, Geo. L...Ocheibank Road, Bristol
- Stoughton, Clarke...Sperham, Norfolk
- Stow, Wm...Farnborough Hall, Kent
- Stracey, Sir Edward, Bt...Backheath Hall, Norwich
- †Stracey, H. Jas...The Grange, Sprowston, near Norwich
- Stracey, John...Sprowston Lodge, Norwich
- Strachan, J. M...Teddington Grove, Middlesex
- Strachey, R...Ashwick Grove, Oakhill, Somersetsh.
- Strafford, H...4, Moreton Villas, Camden Town
- Strangways, Henry Bull...Shapwick, Glastonbury, Somersetshire
- Stratham, Wm...Derby
- Straton, Rev. G. W...Somersal Rectory, Uttoxeter, Staffordshire
- Stratton, Alfred...Rushall, Pewsey, Wiltshire
- †Stratton, J. Locke...Farthinghoe Lodge, Brackley, Northamptonshire
- Stratton, Jas...Manningford Bruce, Pewsey, Wilts.
- †Stratton, Richard...Clarke Street, Bristol
- Stratton, Wm...Upavon, Pewsey, Wiltshire
- Stratton, Wm...Lavenstock, near Overton, Hants
- Streeter, William...Sanderstead, Croydon, Surrey
- Stretton, Wm. R...Dany Park, Crickhowell, Brecknockshire
- Strickland, Henry Eustatius...Apperley Court, Tewkesbury, Gloucestershire
- Strickland, W...Cokethorpe Park, Witney, Oxon
- Strode, Geo...Newnham Park, Plympton St. Mary, Devonshire
- Strode, James Cranborne...Brighton, Sussex
- Stronge, Thos...Cirencester, Gloucestershire
- Strongtharm, Geo...Rushall, Walsall, Staffordshire
- Stroud, H. V...Spettisbury, near Blandford, Dorset.
- Stroud, William...Swansea
- Strouts, E...Kingsdown, near Sittingbourne, Kent
- Strutt, John...Bridge Hill, Belper, Derbyshire
- Stuart, Henry, M.P...18, Hill Street
- Stubbs, C...Freston Hill, Penkridge, Staffordshire
- Stubbs, Henry...Ropley, Alresford, Hampshire
- Stubbs, James...Brockton, near Stafford
- Stubbs, Walter...Wroxeter, Shrewsbury, Salop
- Stunt, John...Gillingham, near Chatham, Kent
- Sturgeon, T. B...South Ockenden Hall, Romford, Essex
- Sturkey, T. O...High Gate, Newtown, Montgomerysh.
- †Sturt, H. Chas., M.P...16, Portman Square
- Stutfield, Wm...Hildersham, Cambridge
- Suckling, Rev. R...Dantsbourn Abbots, Cirencester, Gloucestershire
- Sullivan, Capt. G. J...Ditcham Grove, near Petersfield, Hants
- Sullivan, Rev. Fred...Kimpton Vicarage, Welwyn, Hertfordshire
- Sumner, Rev. O. V. Hoare...Hatchlands, Guildford, Surrey
- Sumner, Col. H...Hatchland Park, Guildford, Surrey
- Sumner, James...New House Farm, Swynnerton, near Stone, Staffordshire
- Surplices, Samuel...Beeston, near Shrewsbury
- Surtees, Rev. J...Banham Rectory, Norfolk
- Sutherland, John Wm...Croydon, Surrey
- Swaffield, Benjamin...Chatsworth, near Chesterfield, Derbyshire
- Swaffield, Samuel...Amphill Park, Bedfordshire
- Swaine, Chas...Wrangle, Boston, Lincolnshire
- Swaine, Thomas...Buckingham
- Swan, George...Gamston, Retford, Notts.
- Swan, John...Cambridge
- Swan, J. W...Hockthum, near Larlingford, Norfolk
- Swan, Wm. Robert...Walls End, Newmarket, Suffolk
- Tyne, Northumberland

- Swann, George... York
 Swann, James... Ensham, near Oxford
 Swann, James... High Onn, Stafford
 Swannell, Joseph... Pavenham, near Bedford
 †Swete, J. B... Oxton House, Exeter, Devonshire
 Swettenham, Jas. Oldham... Belper, Derbyshire
 Swinborne, R... Great Oakley, nr. Colchester, Essex
 Swinburne, Joseph... Knutsford, Cheshire
 Swinford, Stephen... Sarr, Margate, Kent
 Sydney, Viscount... 3, Cleveland Square
 Syer, Rev. T... Little Wrattling, Clare, Suffolk
 Sykes, Edmund... Mansfield Woodhouse, Notts.
 Sykes, John... Sudbury, Suffolk
 Sylverwood, W... Somercotes, nr. Alfreton, Derbysh.
 Symmonds, J... Sutton-Wick, near Abingdon, Berks.
 Symonds, Rev. Thos. Powell... Pengethy, near Ross, Herefordshire
 Symonds, J... Broad-Windsor, Beaminster, Dorset.
 Symonds, T. P... Pengethy, near Ross, Herefordsh.
 Symonds, Wm... Milborne St. Andrew, near Blandford, Dorsetshire
 Symons, Thomas... Coryton, Launceston, Cornwall
 Symons, Thos. Geo... Mynde Park, Herefordshire
 †Synge, Fras. Hutchinson... Weston-super-Mare, Bristol, Somersetshire
 Taber, James... Lawford, Colchester, Essex
 Tabley, Lord de... Tabley House, Northwich, Chesh.
 Tabor, Chas... Bockington Hall, Bocking, Essex
 Tabrum, Litchfield... Boishall, near Ongar, Essex
 Talbot, Hon. and Rev. Arthur... Churcheston, near Stafford
 Talbot, C. E. Mansel, M.P... Margam, Glamorgansh.
 Talbot, Sir Geo... 21, Grosvenor Square
 Talbot, I... Temple Grafting, Moreton-in-Marsh, Gloucestershire
 Talbot, R. Riggs... Wickford, near Rochford, Essex
 Talbot, Samuel Neil...
 Talbot, Hon. and Rev. W. Chetwynde... Ombersley, Stourport, Worcestershire
 Talbot, Wm... Hollings, Preston Patrick, Burton, Westmoreland
 Talbot, Wm. Hawkshead... Scarisbrooke Hall, Ormskirk, Liverpool
 Tancred, Sir Thos., Bt... Stratton House, Cirencester
 Tanner, Wm... Patcham, near Brighton
 Tarlton, Rev. John. Edw... Chelsfield St. Mary, Hook's Cray, Kent
 Tatham, W... Waterloo Iron Works, Andover, Hants
 Tatham, Wm... Torkington, near Bristol
 Tatham, John... 2, Grosvenor Place, Grosvenor, Somersetshire
 Tatham, T. D. F... 27, Bedford Place, Russell Square
 Tatham, T. J... 27, Bedford Place, Russell Square
 Tattersall, Edmund... Grosvenor Place
 Tattersall, Edward... Clare, Suffolk
 Tattersall, John... 61, Ebury Street, Finsbury
 Tattersall, Richard... Grosvenor Place
 Tawnton, W. E... Eresland Lodge, Ensham, Oxon
 Tawnton, Wm. F... Ashley, near Stockbridge, Hants
 Tawson, Samuel... Peterborough, Northamptonshire
 †Tawney, Charles... Oxford
 †Tawney, Henry... Banbury, Oxfordshire
 Taylor, Sir Chas., Bart... Holly Couche Lodge, Liphook, Hants
 Taylor, Chas... High Street, Bristol
 Taylor, Edwd. M... Hayes House, near Stone, Staffs
 Taylor, F. Manley Shawe... Castle Taylor, Ardahan, county Galway
 Taylor, George... Wolverhampton, Staffordshire
 Taylor, George... Brecon
 Taylor, Hen. John... Hay-Gate, Wellington, Salop
 Taylor, Henry... Pilsley, Bakewell, Derbyshire
 Taylor, Hen. Newton Theophilus... Holmer House, Holmer, near Hereford
 Taylor, Isaac... Shrewsbury, Salop
 Taylor, James... Long Compton, Chipping Norton
 Taylor, John... Little Hallam, Derbyshire
 Taylor, John, jun... Coed-Du, Mold, Flintshire
 Taylor, John... Crudgington, Wellington, Salop
 Taylor, John... Brewers' Hall, Mereworth, Wrotham, Kent
 Taylor, John... Langdon, Dover, Kent
 Taylor, John... Essex Standard Office, Colchester
 Taylor, John... Morton Hall, Whalley, Lancashire
 Taylor, John Oddin... Hardingham, Norwich, Norf.
 †Taylor, Joseph... Bishop's Stortford, Herts.
 Taylor, Robert... Treton Mills, Rotherham
 †Taylor, Sam... Eccleston Hall, Prescott, Lancash.
 Taylor, Silas B... 36, Regent Square, St. Pancras
 Taylor, Thos... Bursleigh Villa, Wellington, Salop
 Taylor, Thos. Lombe... Starston, Harleston, Norf.
 Taylor, Walter... Hockley, near Alresford, Hants
 Taylor, William... Wellington, Salop
 Taylor, W... Showle Court, Stoke Edith, Hereford
 Tebbie, Jno... Walcot, near Lutterworth, Leicestersh.
 Tekell, John... Primley Park, near Bagehot, Sussex
 Tempest, Sir C., Bart... Broughton Hall, Shropshire
 Tempest, Henry... Newland Park, Wakefield
 Tempest, Thos... Little Eaton, near Derby
 Templeman, Jno... Merriford, Crewkerne, Somerset.
 †Templemore, Lord... Dunnoby Park, Wexford, Ireland
 Tench, E., jun... Plas-Newydd, Rhwabon, Denbighshire
 Tench, John... Ludlow, Salop
 Tench, Richard... Ludlow, Salop
 Tennant, J. R... Kildwick Hall, Skipton, Yorkshire
 Thacker, Charles... Elford, Staffordshire
 Thackrah, George... 2, Belknap, Middlesex
 Thackwell, John G... Wilton Place, near Ledbury, Herefordshire
 Thatcher, Charles... Midsummer Norton, near Bath, Somersetshire
 Thatcher, William... Wackland, Newchurch, Isle of Wight, Hants
 Thew, E... Lesbury House, Alnwick, Northumb.
 Thickins, Rev. Wm... Kesley House, Coventry
 Thimbleby, Wm... East Kirby, near Bellingbrette, Spilsby, Lincolnshire
 Thistlewood, John... Larnworth, Leath, Lincolnsh.
 Thomas, F. H... Hereford
 Thomas, George... 18, Redcliff Street, Bristol
 Thomas, Rev. Geo... Llandaff Court, near Cardiff, Glamorganshire

- Thomas, Ilted... Hill House, Swansea, Glamorgansh.
 Thomas, Jno... Cholstrey, Leominster, Herefordsh.
 Thomas, Le Marchant... Billingsbear Park, Wokingham, Berks.
 Thomas, R. G... Lllysnewydd, near Carmarthen
 Thomas, Thos. E... Glomnor, Swansea, S. W.
 Thomas, Wm... Dadnor, near Ross, Herefordsh.
 Thomas, Rev. Vaughan... University of Oxford
 Thomason, Henry... Kembeton, Shifnal, Salop
 Thompson, Rev. C... Vicar of Elksley, Retford, Notts.
 Thompson, Rev. Geo... Abbott's Ann, near Andover, Hants
 †Thompson, Henry S... Meat Hall, near York
 Thompson, Jas... Lainsbrigg, Kendal, Westmoreld.
 Thompson, Jas... Kirkhouse, Brampton, Cumberld.
 Thompson, John... Paston, near Wooler, Northumb.
 Thompson, John... Woolvers Farm, Reigate, Surrey
 Thompson, John... Sibsey, Boston, Lincolnshire
 Thompson, John... Ilford, Essex
 Thompson, John S... Clements, Ilford, Essex
 Thompson, Jonathan... Stubbing Court, near Chesterfield, Derbyshire
 Thompson, Robert... Saltwood, Hythe, Kent
 Thompson, Robert... Walton, Stone, Staffordshire
 Thompson, R. J... Kirby Hall, near York
 Thompson, Thos... St. Mary Street, Southampton
 Thompson, W... 12, Dunsford Place, Bathwick, Bath
 Thompson, Wm. C... Cot Hill, Oxford
 Thompson, Wm. Chris. F... Solway House, Carlisle, Cumberland
 Thomson, Edmund P... Legh Lodge, Ardwick, near Manchester
 Thomson, Guy... Old Bank, Oxford
 Thomson, Henry... Primrose, Clitheroe, Lancash.
 Thornewill, Edwd... Dove Cliffe, Burton-on-Trent
 Thornewill, Robert... Burton-on-Trent, Staffs.
 Thornes, Hen... Argoed, Nesscliffe, Shrewsbury
 Thornhill, G., M.P... Diddington, Buckden, Hunts.
 Thornhill, G., jun... Diddington, Buckden, Hunts.
 †Thornhill, Thos., jun... Pakenham Lodge, Ixworth, Suffolk
 †Thornhill, Wm. Pole... Stanton, Bakewell, Derbysh.
 Thornhill, Lieut.-Col. Wm... New Park, Lyndhurst, Hants
 Thornthwaite, Jos... Arkleby House, Cockermouth, Cumberland
 Thornton, Claude G... Marden Hill, near Hertford
 Thornton, Harry... Moggerhanger House, Biggleswade, Beds.
 Thornton, John L... Market Rasen, Lincolnshire
 Thornton, Stephen... Moggerhanger House, Biggleswade, Beds.
 Thorp, Joseph S... Chippenharn Park, Cambridge
 Thorp, Thomas... Alawick, Northumberland
 †Thorp, Archdeacon Thos... Trin. Coll., Cambridge
 Thorpe, Jas. Cole... Otley, Walesby, Market Rasen, Lincolnshire
 Thorpe, John... Pitt, near Hastings
 Thorpe, Rev. Thos... Burton Overy, near Leicester
 Thorne, James... Guernsey
 Thorne, Martin... Gos... Sulhamstead House, near Reading, Berks.
 Threlfall, Lazarus... Lancaster
 Thresher, Fred... Bentley, Farnham, Surrey
 Thring, Rev. J. G... Alford House, Castle Carey, Somersetshire
 †Throckmorton, Sir R. G... Buckland, near Faringdon, Berks.
 Thruston, Capt. C. T., R.N... Talgarth, Machynlleth, Aberystwith, Montgomeryshire
 Thruston, J... Market Weston Hall, Harling, Norf.
 Thursfield, Wm... Barrow, near Broseley, Salop
 Thurnall, Henry... Royston, Herts.
 Tice, Wm... Sopley, near Ringwood, Hants
 Tichborne, Sir Henry, Bart... Tichborne, Alresford, Hants
 Tiernan, Thos... Ruthkenny, Slane, Ireland
 †Tighe, Wm. Fownes...
 Tilden, John... Ifield Court, Gravesend, Kent
 Tilly, Tobias H... Tremough, Falmouth, Cornwall
 †Tillyard, P... Godmanchester, near Huntingdon
 Tillyer, George... Feltham, Middlesex
 Tillyer, James... Harmondsworth, Middlesex
 Tillyer, James, jun... Harmondsworth, Middlesex
 Timm, Joseph... Champion Hill, Camberwell
 Timm, Wm... Ratcliff Grange, Worksop, Notts.
 Timmis, Joseph... Keel, near Newcastle, Staffs.
 Timms, Wm... Cadley Hill, Burton-on-Trent
 Timson, Rev. Edwd... Woodlands House, near Southampton
 Tindal, Thos... Aylesbury, Bucks.
 Tindale, Benj... Ewerby, near Sleaford, Lincolnsh.
 Tindale, Thomas... Silk Willoughby, near Sleaford, Lincolnshire
 Tindale, W... Wheatley, Doncaster
 Tingey, John... Scoulton, Hingham, Norfolk
 Tinker, Wm... Concock House, Devises
 Tinkler, R... Bolton, Westmoreland
 Tinsling, Capt. Charles... 4, York Place, Worthing, Sussex
 Tinne, John A... Briarley, near Aigburth, Liverpool
 Tisdale, Thos... Quarry Terrace, Shrewsbury
 Todd, Jos... Sutton Colefield, near Birmingham
 Toker, R. E... Kenfield House, Canterbury, Kent
 Tollemache, Henry Bertie... Junior United Service Club, Regent Street
 †Tollemache, Jas., M.P... Tilston Lodge, Tarporley, Cheshire
 Toher, Samuel... Godgrave, Orford, Suffolk
 Toller, Geo... Bailey Hall, near Newcastle, Staffs.
 Tolly, Thomas... Twining, Tewkesbury, Gloucest.
 Tombs, E... Maizey Hampton, Fairford, Gloucest.
 Tombs, John... Great Barrington, Burford, Oxon
 Tombs, Joseph... Haverfordwest, Pembrokeshire
 Tomes, Thos... Norgrove, Feckenham, Worcestersh.
 Tomkins, W. Steele... Broughton, near Stockbridge, Hants
 Tomline, Col. Geo., M.P... 1, Carlton House Terrace
 Tomlinson, Capt. Fredk... Cliffe Ville, Newcastle-under-Lyne, Staffordshire
 Tomlinson, Richard... Shelley Hall, Ongar, Essex.
 Tomlinson, Wm... Biggins House, Kirkby Lonsdale, Westmoreland
 Tompson, Chas. K... Witchingham Hall, Norwich, Norfolk

- Tompson, Rich. Jas...Round Coppice, Iver, Bucks.
 Tomson, Chas...Lower Sandon, Luton, Beds.
 Tonge, Charles...Branston, near Lincoln
 Tonge, John, jun...Edenbridge, near Seven Oaks, Kent
 Tonge, Wm., sen...Morante Court Farm, Chevening, Seven Oaks, Kent
 Tongue, Edwd...Aldridge, Walsall, Staffordshire
 Tongue, W...Comberford, near Tamworth, Staffs.
 Tooke, Rev. Alfred...East Mordon, near Blandford, Dorsetshire
 Tooke, Wm...12, Russell Square
 Toomer, James H...Rhinefield Lodge, Lyndhurst, Hants
 Toovey, T...Joyce Grove, Henley-on-Thames, Oxon
 Toovey, Wm...Crowmarsh, Newnham, Wallingford, Berks
 Topham, James...West Keal, Spilsby, Lincolnsh.
 Topham, Robt...Mowthorpe, Malton, Yorkshire
 †Torkington, James...Stukely, Huntingdonshire
 †Torr, Wm., jun...Riby, near Caistor, Lincolnsh.
 Toswill, James H...Pitt, near Chudleigh, Devonsh.
 Tottenham, Zophus...Gleparne House, Florence Court, county Leitrim, Ireland
 Toulson, John P...Skipwith Hall, Selby, Yorksh.
 Tower, Chris. T...Weald Hall, Brentwood, Essex
 Towers, Jno...Pinkney's Green, near Maidenhead, Berks
 Towneley, Chas...Towneley, Burnley, Blackburn, Lancashire
 Townley, Rev. Charles...Little Abingdon, Linton, Cambridgeshire
 Townley, Rev. G...Beaure Hall, Wisbeach, Cambs.
 Townsend, Henry...King's Newnham, Brinklow, Rugby, Warwickshire
 †Townsend, T...Hillmorton, Rugby, Warwicksh.
 Townsend, Wm. H...3, Montague Parade, Bristol
 Townshead, Geo...Sapcote, Hinckley, Leicestersh.
 Toyabee, Geo...Hickington, Sleaford, Lincolnsh.
 Trafford, Sir. Thos. De, Bart...Trafford Park, Manchester, Lancashire
 Traherne, Rev. John M...Coedrigtan, near Cardiff, Glamorganshire
 Trebeck, Thomas...Southwell, Notts.
 Treby, Hen. H...Cobham Lodge, Cobham, Surrey
 Tredgold, Hen...East India College, Haileybury, Herts.
 Tredwell, J. C...Oddington Grange, Bicester, Oxon
 Tredwell, J. C...Beymour...105, Pall Mall
 Tredwell, Rev. John A...Stanton House, Swindon, Wilts.
 Trench, Rich...Freshill, Southampton, Hants
 Tressawa, Sampson...Probus, near Truro, Cornwall
 Tretwey, Hen...Bredwardine, near Hereford
 Trew, Hon. Gen...Glynde, near Lewes, Sussex
 Trew, Thomas...Southampton
 Trinder, Daniel...Cirencester, Gloucestershire
 Trinder, Wm...Wantage, Berks.
 Tripp, W. Upton...Oreham Wyndham, Taunton, Somersetshire
 Troilope, Sir John, Bart, M.P...Casewick, Stamford, Lincolnshire
 Troilope, Capt. W. H...Landford House, Salisbury
 Trood, E...Matford House, Exminster, Devonsh.
 Trotter, John...Staindrop, near Darlington, Durham
 Trotter, Robert...Twynford, East Grinstead, Sussex
 Trotter, Thomas...Bywell, Newcastle-on-Tyne
 Trower, Capt. E. S...Watton House, Ware, Herts.
 Trower, Hen. S...Castle Thorpe, near Stony Stratford, Bucks.
 Trudgen, Hen. H...Trevilly, Penzance, Cornwall
 Trumper, Edwd...Nuneham Park, near Oxford
 Trumper, Robt...Wyke Farm, Isleworth, Middlesex
 Trumper, Wm...Iver, Colnbrook, Bucks.
 Trumper, Wm...Dorney, Maidenhead, Berks.
 Trustram, John...Higham Gobion, Silsoe, Beds.
 †Tryon, Thos...Bulwick, Wansford, Northampton.
 Tuck, Rev. G. R...Rectory, Wallington, near Baldock, Herts.
 Tuck, Henry...Ayon, Ringwood, Hants
 Tuck, John H...Blodfield, near Norwich, Norfolk
 Tuck, John Johnson...Worham, Eye, Suffolk
 Tuckett, A...Moorend, Mangotsfield, near Bristol
 Tuckett, Fras...Frenchay, near Bristol
 Tuckett, Philip Debell...Frenchay, near Bristol
 Tuckey, Thos...Compton Beauchamp, Faringdon, Berks.
 Tuckwell, Humphrey...Signet, near Burford, Oxon
 Tudor, Thos...Wyshaw, near Monmouth
 †Tudway, R. C...Wells, Somerset
 †Tull, Edward...Peasemore, Newbury, Berks.
 †Tull, Rich...Crookham, Newbury, Berks.
 Tunalley, Thomas, jun...Derby
 †Tunnard, Thos...Frampton, Boston, Lincolnsh.
 Turbutt, G...Ogston Hall, near Alfreton, Derbysh.
 †Turnbull, John G...2, Sussex Square, Bayswater
 †Turnbull, Rev. T. Smith...Cains Coll., Cambridge
 Turner, Ellis...Caston Hall, Watton, Norfolk
 Turner, George...Fletching, Uckfield, Sussex
 Turner, George...Bartop, near Exeter, Devonshire
 Turner, Henry John...Richmond, Yorkshire
 Turner, James...Oxford
 Turner, J. S...Little Buckingham, Shoreham, Suss.
 Turner, Jas. Thos...Colebrooke, Crediton, Devonsh.
 Turner, John...Noke, near Leominster, Herefordsh.
 Turner, John...Gravetye Manor, West Hoathly, near East Grinstead, Sussex
 Turner, J. B...Brockmanton, Leominster, Hereford.
 Turner, John Henry...Summerford William, East Grinstead, Sussex
 Turner, Philip...Westside, near Hereford
 Turner, Sam...Branch Bank of England, Liverpool
 Turner, T...Castwood Farm, Rotherham, Yorksh.
 Turner, Thos...Croydon, Surrey
 Turner, Vincent J...Shipiton, near Woodstock, Oxon
 Turner, Wm...Shipiton, near Woodstock, Oxon
 Turner, Wm...Lyth, Kendal, Westmoreland
 Turner, Wm. Becket...Wantage, Berks.
 Turner, W. H...8, Mount Place, Whitechapel Road
 †Turnor, C. M.P...Stoke, Grantham, Lincolnsh.
 Turnor, Michael...Brereton, Rugeley, Staffordsh.
 Turner, Thos...Abbotts Bromley, Rugeley, Staffs.
 Tweed, Thos...Bowler Gosport, Woolwich, Kent
 Tween, Wm...Hastage, Sible Hedingham, Hants, Essex
 Twemlow, Thos...Peatswood, Drayton, Salop

Twigg, Samuel... Barnfields, near Stafford
 Twining, F... Farbold Hall, Standish, Wigan
 Twist, J... Norwich, Norfolk
 Twort, Tyler... Horsmonden, Kent
 Twyford, Rev. Chas. E... Trotton, Midhurst, Sussex
 Twynnam, John, M.D... Lainston House, near Winchester
 Twynnam, Thos... Bishopstoke, near Winchester
 Tylden, Lieut.-Col. Sir J... Milsted, Sittingbourne, Kent
 Tyler, John... Layton, Essex
 Tyler, Rev. Roper T... Llantrithyd, near Cardiff, Glamorganshire
 Tynte, C. J. K... Cefa Mabby, Cardiff, Glamorganshire
 Tyreconnel, Earl of... Kiplin, Catterick, Yorkshire
 Tyrell, Sir J., Bart... Boreham House, Chelmsford
 Tyrer, James... Booth, near Liverpool
 Tysen, Wm. Geo. D... Foulden Hall, Stoke Ferry, Norfolk

Ullock, T... Bowness, near Kendal, Westmoreland
 †Umbers, Edward... Weston Hall, near Warwick
 Umbers, S... Duntun Hall, Coleshill, Warwickshire
 Umbers, T... Wappenbury, Leamington, Warwicksh.
 Umbers, Wm... Weston Hall, near Warwick
 Underwood, Captain Wm... Castle Hill, Bakewell, Derbyshire
 Unthank, David... Warren Farm, Tottenham Park, Marlborough, Wilts.
 Unwin, Edward W... Parkfield, Derby
 Upperton, Edwd. F... Thakeham, near Storrington, Sussex
 †Upperton, Robt... 35, Steyne, Brighton, Sussex
 Uppley, L... Wootton House, Barrow-on-Humber, Lincolnshire
 Upton, Henry, sen... Coleworth Oving, Chichester, Sussex
 Upton, H., jun... Aldwick, Bognor, Chichester, Sus.
 Urry, B... Newport, Isle of Wight, Hants
 Urwick, Edward... Felton, Ludlow, Salop
 Utting, John... Stanning Hall, Norfolk
 Utton, Thomas... Brome, Eye, Suffolk

Vaisey, Thomas... Stratton, near Cirencester, Glouc.
 Vaisey, Geo. De Horne... Halstead, Essex
 Vallance, Jas... Hurstperpoint, Brighton, Sussex
 Vanderstegen, W. H... Cane-end House, near Henley, Oxon
 Vandeleur, Geo... King's Newton Hall, Derby
 †Vane, Rev. John... Dulwich, Surrey
 Vanner, William... Guildford, Surrey
 Vansittart, Captain Robt... 1, Halkin Street West
 Vardon, T... (Librarian of the House of Commons)
 Vaughan, Hugh... Redland, near Bristol
 †Vaughan, N. V. E... Rhesla, near Neath, Glamorganshire
 Vaughan, Philip... Brecon, S. Wales
 Vaughan, Sir Robt. W... Hengurt, Dolgelly, Merionethshire
 Vaughan, Rev. Thomas... Llandwailog, Brecon
 Vaughan, Colonel W... Woodstone, Huntingdonsh.

†Vavasour, Hon. Sir E. M., Bart... Hazlewood Hall, Tadcaster, Yorkshire
 Vavasour, Sir Henry M., Bart... Melbourne Hall, Pocklington, Yorkshire
 Veal, John B... Ringmer, near Lewes, Sussex
 Veale, Jas. H... Passaford, Hatherleigh, Devon
 Veasey, David... Castle Hill House, Huntingdon
 Venables, Chas... Woburn, Beaconsfield, Bucks.
 Venables, Rich... The Hoarstone, Hodnet, Market Drayton, Salop
 Vere, John... Carlton-on-Trent, Newark, Notts.
 Verelst, Rev. William... Grayingham, Kirtton-in-Lindsey, Lincolnshire
 Verity, Rich., M.D... Dean, Kimbolton, Hunts.
 †Verney, Sir Harry, Bart... Claydon House, Winslow, Bucks.
 Vernon, Geo. Croft... Mount Flanbury, Bromsgrove, Worcestershire
 Vernon, Granville H., M.P... The Grove, East Retford, Notts.
 Vernon, Hon. and Rev. John V... Nuthall Rectory, near Nottingham
 Vevors, Wm... Donnington Court, Hereford
 Viall, King... Stoke, Clare, Suffolk
 Viall, Samuel... Foxearth, near Sudbury, Suffolk
 Viband, James... Chilliswood House, Taunton
 Vickers, Abraham... Manchester
 †Vickers, V... Ellerton Grange, Newport, Salop
 Villiers, Viscount, M.P... Upton Park, Banbury
 Vincent, Hy. Wm... Queen's Remembrancer's Office, Duke Street, Westminster
 Vincent, Rev. J. V... Gording, Bangor, Carnarvon
 Vincent, Wm... Nutfield, near Bletchingley, Surrey
 Vines, Richard... 33, Gt. College St., Camden Town
 Vining, William... Clifton, near Bristol
 Vipan, Walter... The Hermitage, Earith, St. Neots, Hunts.
 Vivian, Lord... Plas Gwyn, Beaumaris, Anglesea
 Vivian, Edward... Torquay, Devonshire
 Vivian, Geo... Claverton Manor, Bath, Somerset
 Vizard, Wm... 16, New Street, Spring Gardens
 Vogan, Rev. Thomas S. L... Vicar of Walburton, Arundel
 Voss, Wm... West Bucknowle, Corfe Castle, Dorset
 Vowles, Henry... Park Farm, Bath

Wace, Henry T... College Hill, Shrewsbury
 Waddell, J... Coates, Whittlesey, Cambridgeshire
 Waddington, J. H... Langrish, Petersfield, Hants
 Waddington, H. S., M.P... Cavenham, Mildenhall, Suffolk
 Waddington, John T... Twyford Lodge, near Winchester, Hampshire
 Wade, Rev. A... Elton Rectory, Stockton-on-Tees, Durham
 Wade, Chas... Hawkshutts, Brewood, Wolverhampton
 Wade, Wm. Thos... Gt. Dunmow, Essex
 Wadham, Thomas... Frenchay, near Bristol
 Wagner, G. H. M... Hurstmonceaux, Battle, Sussex
 Wagstaff, Edwd... Gordon Castle, Pochabers, N. E.
 Waite, Emant. J. B... 4, Kingsdown Parade, Bristol
 Waite, John U... Sibsey, near Boston, Lincolnshire
 Waite, Wm. S... Woodborough, Bath, Somersetshire

- Wake, Bartholomew, M.D....Castle Cary, Somerset
 Wake, Sir Wm., Bart....Courteen Hall, Northamp.
 Wakefield, George....Minworth, Birmingham, Warwickshire
 Wakefield, John....Sedgwick House, Kendal, Westmoreland
 Wakeley, T....Rainham, near Sittingbourne, Kent
 Wakeman, Thos....Graig, near Monmouth
 Wakerley, John....Granby, Bingham, Notts.
 Walbey, H....Wyddial, near Buntingford, Herts.
 Walbey, Thos. C....Sandon, Buntingford, Herts.
 Walcot, Rev. C....Butterley Court, Ludlow, Salop
 Walford, John H....Wem, Salop
 Walkden, Thos....Rushall Down, near Pewsey, Wilts.
 Walker, Chas....Ellaston, near Ashbourne, Derbysh.
 Walker, Chas....Sutton, near Tenbury, Worcester-sh.
 Walker, C. L....Redland, near Bristol
 Walker, David, M.A....Colchester, Essex
 Walker, D....Netherwood, Tenbury, Worcestershire
 †Walker, Geo....Eastwood, near Nottingham
 Walker, George....Wootton Park, near Ashbourne, Derbyshire
 Walker, Geo. R....Heathfield House, near Oxford
 Walker, G. N....Market Cell, Market Street, Herts
 Walker, Rev. Hy....Heathfield House, near Oxford
 Walker, Henry B....New Romney, Kent
 Walker, James....Northleach, Gloucestershire
 Walker, John....Lulby Court, near Worcester
 Walker, John....Westfield House, Holmer, near Hereford
 Walker, J. E....23, Edward Street, Portland Place
 Walker, J. R....Eaton Socon, St. Neots, Hants.
 †Walker, Ormerod O....Bury, Lancashire
 Walker, S....Goadby Marwood, Melton Mowbray, Leicestershire
 Walker, Thos....Dane's Hill, East Retford, Notts.
 Walker, Thomas....Berryholme, Sizergh, Kendal, Westmoreland
 Walker, Thos....The Bank, Doncaster, Yorkshire
 Wall, James....Sheffield
 Waller, H. S....Farmington, Northleach, Gloucester
 Wallington, James....Charlecote, Stratford-on-Avon
 Wallis, O....Overstone Grange, near Northampton
 Wallis, W. T....New Slifford Farm, near Witney, Oxon
 Walmsley, John....Creamore, Wem, Salop
 Walmsley, T....Ribbledale Place, Preston, Lanc.
 Walpole, Wm....
 Walwood, Lloyd B....Flanley, Westbury-on-Tyeme, Gloucestershire
 Walsh, John....Oxford
 Walter, John....Gore House, Upchurch, Sittingbourne, Kent
 Walter, Wm....Rainham, Upchurch, Sittingbourne, Kent
 Walter, Rev. Wm. K....Abbotslam Vicarage, Bideford, Devon
 Walters, Edwd....Libbear Shebbear, near Black Torrington, Hatherleigh, Devon.
 Walters, Henry....10, Somerset Place, Bath
 Walters, John....Derby
 †Walters, Jas. W....Barnwood, near Gloucester
 Walthall, P....Harley Dale, near Marlock, Derbysh.
- Walton, John....Seel Street, Liverpool
 †Walton, Thos....Albany House, Old Kent Road
 Walton, Wm....Castle Ashby, Northampton
 Walton, Wm....Mendon Farm, Thurbly, Winchester
 Warburton, Rowland L. E....Haleley Hall, near Northwich, Cheshire
 Ward, Danvers Hill....College Green, Bristol
 Ward, G. A....Downham Bridge, Norfolk
 Ward, Henry Wm....Wisbeach, Cambridgeshire
 Ward, John....79, Bishopsgate Street, Witham
 Ward, Samuel....Repton, near Derby
 Ward, Thomas....Duffield, near Derby
 Ward, T. E....The Lodge, Clurk, Denbighshire
 Ward, Thomas R....Round Oak, Englefield Green, Chertsey, Surrey
 Ward, Wm. Thos....26, Old Elvet, Durham
 Ward, Wm. Fred....Wisbeach, Cambridgeshire
 Warde, Charles....Squerries, Westerham, Kent
 Warde, J. R....Yalding Parsonage, Maidstone, Kent
 †Ware, Samuel....34, Portland Place
 Waring, Thos....Chelsfield, Foot's Cray, Kent
 Warman, Robt....Idstone, near Farningdon, Berks.
 Warne, Joseph....Upway, Weymouth, Dorset
 Warner, Frederick....28, Cornhill, London
 †Warner, George....Priory, Hornsey, Middlesex
 Warner, Henry....The Elms, Loughborough
 Warner, Henry L....Tibberton Court, near Hereford
 Warner, James....Harefields, Bishop's Waltham
 Warner, Jas....Tivall Hall Farm, Great Haywood, near Stafford
 Warner, Jas....Steeple Court, Botley, Southampton
 Warner, Wm....Botley, Southampton
 Warner, Wm. M....St. John's Street, Oxford
 Warre, Henry....Haling Grove, Croydon, Surrey
 Warre, John A....West Cliff, Ramsgate, Kent
 †Warren, Rev. J. C. B....Horsley Hall, Colchester, Essex
 Warren, Rich....Shillington, Blandford, Dorset.
 Warren, W....Cambridge
 Warrender, Sir G., Bart....Chifin House, Maidenhead, Berkshire
 Warriner, George....Bloxham Grove, near Banbury, Oxon
 Warry, Elias T....Lyndhurst, Hampshire
 Wary, Geo....Shapwick, Glastonbury, Somerset.
 Warsop, John....Alconbury Hill, near Huntingdon
 Warton, Henry de Grey....Marle, Shrewsbury
 Wartinaby, John....Clipsal, Market Harborough, Leicestershire
 Warwick, W. Atkinson....Cambridge
 †Wassey, J. T....Prior's Court, near Newbury, Berks.
 Washbourne, E. B....Pyle Hill, Newbury, Berks.
 Washbourne, T. E....Donnington, Newbury, Berks.
 Washbourne, W....Tillingdown, Tandridge, Surrey
 Wason, Rigby....Kildonan, Newton-Stewart, N. B.
 Wass, Joseph....Lea, near Marlark Bath, Derbyshire
 Waterhouse, Alfred....Aigburth, near Liverpool
 Waterhouse, Daniel....Aigburth, near Liverpool
 Waterhouse, Rogers....Aigburth, near Liverpool
 Waterpark, Lord....Doveridge Hall, Uttoxeter, Staffs.
 Waters, Robt....Boscombe, Amesbury, Wilts.
 Waters, T....Stratford Sub-Castle, Salisbury, Wilts.
 Waters, W....Wighton, near Walsingham, Norfolk

- Waters, W... Rushmoor, Carmarthen, S. W.
 Watford... Alex... Cambridge
 Watken, Thos... Trevas, near Hereford
 Wathey, John... Lea, near Matlock, Derbyshire
 Watkins, E. B... Brownllis, Brecknockshire
 Watkins, Rev. F... Lewes, Sussex
 †Watkins, John G... Woodfield House, Ombersley, near Worcester
 Watkins, Lloyd V... Pennyre, near Brecon
 Watkins, Saml... Forest Hill, near Workshop, Notts.
 Watkins, Sober... Plumptre, Penrith, Cumberland
 Watkins, Thos... Ford Vaur, Hay, Brecon
 †Watkins, Wm... Ombersley, Worcester
 Watson, B. F... 16, Cambridge Terrace, Hyde Park
 †Watson, Chas. W... Wratting Park, Linton, Cambridgeshire
 Watson, Geo... Wellingham, Fakenham, Norfolk
 Watson, H... Walkingham, Gringley, Bawtry, Notts.
 Watson, J... Allendale Brewery, Haydon Bridge, Northumberland
 †Watson, James... Thofney, near Peterborough, Northamptonshire
 Watson, John... Bolton Park, Wigton, Cumberland
 Watson, Lieut.-Gen. Sir James... Wendover House, Bucks.
 Watson, James... Wouldby, near Hull, Yorkshire
 Watson, John... Allerwash, Hexham, Northumb.
 Watson, Samuel... Derby
 Watson, Capt. Wm... 14, Gt. Camberland Place
 Watson, Wm. C... 4, Albany Terr., Regent's Park
 Watson, Wm. J... Gt. House, St. Nicholas, Cardiff, Glamorganshire
 Watt, Jas... Queen's Proctor for Ireland, Dublin
 Watton, John... Chronicle Office, Shrewsbury
 Watts, James... Hythe, Kent
 Watts, James... Hythe, Kent
 Watts, Robert... Battle, Sussex
 Watts, Wm... Scaldwell, Northampton
 Wavell, Wm... Lake, Newport, Isle of Wight
 Way, Rev. H... Henbury, near Bristol
 Wayman, C... Troston, Bury St. Edmunds, Suffolk
 Wayne, Thos. M... Manor House, South Warnborough, Odiham, Hants
 Wayte, Henry S... Milton, near Derby
 Wayte, Wm... Basford, near Nottingham
 Weall, Thos... Woodcote Lodge, Beddington, Surrey
 Webb, Daniel C... Hethe, Bicester, Oxon
 Webb, Geo... Beaumont Hall, near St. Albans, Herts.
 Webb, Henry... Gazeley, Newmarket, Cambridgesh.
 Webb, John... Horseheath, Cambridgeshire
 Webb, J... Church Farm, Babraham, Cambridgesh.
 Webb, Rich... Calcot, near Reading, Berkshire
 Webb, Samuel... Babraham, Cambridgeshire
 Webb, Thomas... Babraham, Cambridgeshire
 Webb, Thomas... Hildersham, Cambridgeshire
 Webb, Sir Thomas, Bart... Barton, Burton-on-Trent, Staffordshire
 Webb, Theodore V... Clare Hall, Cambridge
 Webb, Rev. Wm... Master of Clare Hall, Cambridge
 Webb, Wm... 3, Arundel Street
 Webb, Wm... Hasel, Tamworth, Staffordshire
 Webb, W... Cowley, near Stafford
 Webb, Wm... Stourbridge, Worcestershire
 Webb, Wm... Lee, Southampton
 †Webber, Chas. H... Buckland, Barnstaple, Devon.
 Webster, F... Marley Farm, Battle Abbey, Sussex
 Webster, Geo... Hallfield House, Desford, near Market Bosworth, Leicestershire
 Webster, James... Peakirk, Market Deeping, Linc.
 Webster, Joseph... Penns, near Birmingham
 Webster, J. P... West Heath Cottage, Congleton, Cheshire
 Webster, Thomas... Kendal, Westmoreland
 Webster, William, jun... Upton Hall, Birkenhead, Liverpool
 Webster, Wm... Biggin, near Ashbourne, Derbysh.
 Webster, Wm. B... Houndsdown, near Southampton
 Wedd, Octavius... Foulmire, near Cambridge
 Wedge, Charles... Hornwood Farm, Meridan, near Coventry
 Wedge, Frans... Badminton, Tetbury, Gloucestersh.
 Wedge, John H... Six-mile Bottom, Newmarket, Cambridgeshire
 Wedge, Morton Chas... Derby
 Wedlake, Mrs. M... Hornchurch, Essex
 †Weeding, Thos... 47, Mecklenburgh Square
 Weeks, Fred... Hurstperpoint, Brighton
 Weeks, Richard M... Ryton, Newcastle-on-Tyne
 Welbeck, Capt... Tandridge Priory, Godstone
 Welch, Alfred... Southall, Middlesex
 Welch, John... Rachimbid Back, Ruthin
 Welch, Rev. Thomas Coleman... Lower Vicarage, Pottishall, near Towcester, Northamptonsh.
 Welchman, Robt... Hockley Ho., Southam, Warwickshire
 Weld, Edw... Tavistock Court, Barnstaple, Devon.
 Welfitt, Wm. Teale... Manby Hall, Louth, Lincolnsh.
 Welford, R. G... Northaw, near Barnet, Middlx.
 Weller, Richd... Capel, Dorking, Surrey
 Wellings, Thos... Muckleton, near Shrewsbury
 Wells, Charles... Ware, Herts.
 †Wells, Edward... Wallingford, Berkshire
 Wells, Fleetwood... Walton Ho., Aylesbury
 Wells, Hy... Shenditch, Hemel Hempstead, Herts.
 Wells, John... Woodborough, near Nottingham
 Wells, Thos... Hampnett, Northleach, Gloucestersh.
 Wells, Thos... Fulbourne, near Cambridge
 Welman, C. Noel... Norton Manor, Taunton
 Welsh, Wm... Leake, Boston, Lincolnshire
 Welstead, Benjamin... Kimbolton, Hunts.
 Wemyss, Major-Gen... Cumberland Lodge, Windsor Park
 Wentworth, Godfrey... Woolley Park, Wakefield, Yorkshire
 Wentworth, H. C... Roffy Hall, Harlow, Essex
 West, Edw. Hill... Stoke Bishop, near Bristol
 West, Capt. Henry, R.N... Jesmond, near Newcastle-on-Tyne
 West, John... Collingham, near Newark, Notts.
 West, John... Miningsby, near Spilsby, Lincolnsh.
 West, J... Melton Ross, Brigg, Lincolnshire
 West, Wm. H... Giffaes, Crickhowell, Brecknocksh.
 Westbury, Glas... Andover, Hampshire
 †Westcar, Henry... Burwood Cottage, Raher, Surrey
 Westcote, John Baker... Cote Martock, Somerset

- Westminster, Marquis of...Motcombe House, Shaftesbury, Dorset
 †Weston, James, Jun...Stoneleigh, Coventry, Warwickshire
 Westrope, Wm....Freckenham, Suffolk
 Wetherell, Wm....Durham
 †Weyland, J....Woodrising Hall, Ivingham, Norfolk
 Weyland, Rd....Woodeaton House, near Oxford
 Whalley, Chas....South Crescent, Liverpool
 Whalley, Chas. Lawson...Lancaster
 Whalley, Capt. († B....2, Keynsham, Bank, Cheltenham
 Whalley, Jos....South Crescent, Liverpool
 Whalley, Robt....Brantham Hall, near Manningtree, Essex
 Whapham, W....Bonvillstone, near Carlisle, Glamorganshire
 Wharton, Francis...Dunscroft, Hatfield, near Doncaster, Yorkshire
 †Wharton, J. T....Skelton Castle, Guisborough, Yorkshire
 Wheatcroft, Abraham...Cromford, near Bakewell, Derbyshire
 Wheatcroft, David...Buckland Hollow, near Belper, Derbyshire
 Wheatcroft, Nat....Willersley Farm, near Matlock, Derbyshire
 Wheatcroft, W....Cromford, near Bakewell, Derbys.
 Wheble, Edmd....Great Baddow, Chelmsford, Essex
 Wheeler, J....Trippleton, Leintwardine, Ludlow, Shropshire
 Whetham, Col....Kirklington Hall, Southwell, Notts.
 Whieldon, G....Wilton Place, Daventry, Northiam.
 Whitaker, Josh....Bratton, Westbury, Wiltshire
 Whitaker, Joseph....Ramsdale House, Nottingham.
 Whitaker, W....The Ash, Etwell, near Derby
 Whitbread, John....Hazlewood Farm, Edlington
 †Whitbread, Saml. Chas....22, Eaton Place
 Whitby, Mrs. Mary A. T....Newlands, Lymington, Hants.
 Whitcombe, John Aubrey...Gloucester
 White, Alg. Holt...Clements Hall, Rochford, Essex
 †White, Henry...Warrington, Lancashire
 White, J....Parsonage Farm, Rickmansworth, Herts.
 White, James...Yaverland Farm, Isle of Wight
 White, Joseph....Little Witley, near Worcester
 White, J. H....Chevening, near Sevenoaks, Kent
 White, Joseph...Ampfield House, Romsey, Hamps.*
 White, Robt....Zeals, Mere, Wilts.
 White, Richd....Prior Halton, Ludlow, Salop
 White, R. Edw....Aspley Guise, Woburn, Bedfordh.
 White, T....Mims Hall, South Mims, Middlesex
 White, T....Berechurch Hall, near Colchester
 White, T....Kenward, Yalding, Maidstone, Kent
 White, Wm....Newsells, Royston, Herts.
 Whitehead, J....Barnet, West Barning, Maidstone
 Whitehead, Rd....West Farleigh, Maidstone, Kent
 Whitman, John...Rudham Grange, Rougham, Norf.
 Whitfield, W....Fallow, near Wantage, Berks.
 Whiting, John...Heston, Hounslow, Middlesex
 Whiting, T. S....Codford Wilks, near Warminster
 Whiting, Wm....Monmouth
 Whitlaw, Chas....30, Argyl Street
 Whitlock, Fras....Great Yeldham, Ilalstead, Essex
 Whitnell, J....Crick, Daventry, Northamptonsh.
 Whitmore, Rev. Chas....Stockton, Shifnal, Shrops.
 †Whitmore, T....Apley Park, Bridgenorth, Salop
 Whitmore, W. W....Dudmaston, Bridgenorth, Salop
 Whitney, J....Westbury, Bristol, Somersetshire
 Whitaker, Rev. G. Aytton...Knodishall, near Saxmundham, Suffolk
 Whittaker, Thos....Boxted, Colchester, Essex
 Whittam, James Sibley...Coventry
 Whitter, Wm....Worthing, Sussex
 †Whitting, Wm....Thorney, near Peterborough, Northamptonshire
 Whittington, G. T....Whitmore House, Guildford, Surrey
 Whittle, J. . . .Toller Fratrum, Dorchester, Dorset
 Whittuck, Sam....Hanham Hall, near Bristol
 Whitworth, H. B....Northampton
 Whitworth, Joseph...Manchester
 †Wickens, Jas. Stephens...35, Mortimer Street
 Wickham, Jas....Sutton Scotney House, Andover Road, Hants.
 Wickham, J....Butcombe, near Shepton Mallet, Somerset
 †Wicksted, Chas. . . .Shakenhurst, Cleobury Mortimer, Salop
 Widdicombe, J....Hay Ughborough, Totness, Devon
 Wigan, Edmund...Lapley Breewood, Wolverh.
 Wigg, Wright...South Green, East Dereham, Norf.
 Wiggins, Hen....Muff, Londonderry, Ireland
 Wiggins, John...Tyndales, near Danbury, Essex
 †Wight, J. L....Teddstone Court, Bromyard, Heref.
 Wilberfoss, Thos....Wetwang, Driffield, Yorks.
 Wild, J....The Park, Nottingham
 Wild, S. Bagnall...Costock, near Loughborough, Leicestershire
 Wild, T. M....Branbridge, East Peckham, Tunbridge, Kent
 Wilding, Jas....High Lreal, Wellington, Salop
 Wiley, Sam....Bransby, near York
 Wilkin, C....Tollshunt Knight, Kelvedon, Essex
 Wilkin, C....Tverton, near Bath, Somersetshire
 Wilkinson, Geo. H....Harperley Park, Durham
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Royal Agricultural Society of England.

1845—1846.

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Royal Agricultural Society of England.

GENERAL MEETING,

12, HANOVER SQUARE, THURSDAY, MAY 22, 1845.

REPORT OF THE COUNCIL.

THE attention of the Council during the last half-year has been directed principally to the following points:—

I. The revision of the List of Members, and a scrutiny into the several cases of Members who claim exemption from the liabilities of their election on the ground of the peculiar circumstances under which their election took place.

II. The consideration of the arrears of subscription, and of the mode by which their collection may be facilitated.

III. The adoption of a more general plan for the nomination and selection of the Judges of Stock and Implements.

IV. An extension of the trial of implements beyond the place and period of the Country meetings. And lastly,

V. A chemical analysis of the ashes of plants grown on different soils and in different localities throughout the kingdom.

1. The Finance Committee have reported the details, of which a statement is now laid on the table, connected with the numbers of Members, the amount of arrears, and the investment of capital. At the last General Meeting in December, the Society consisted of 6827 Members: since that date, 314 Members have been elected, while 161 have been struck off the list, and 47 have died; so that the Society at present consists of—

Life Governors	96
Annual Governors	204
Life Members	495
Annual Members	6123
Honorary Members	15

making a total of 6933 Members.

2. It appears from the statement of arrears that on the 1st day of the present month 35 Governors and 2281 Members were in arrear of subscription, the sum amounting to 5730*l.*; that at the General Meeting in December last the amount of such arrears stood at 6609*l.*, a reduction of 879*l.* having been effected during the last six months. The present amount of invested capital is 8200*l.*, a purchase of 500*l.* stock in the $3\frac{1}{4}$ per cents. having been made during the last month. The current cash balance in the hands of the Society's bankers at the present time is 2038*l.*, not including the sum of 1000*l.* contributed by the town of Shrewsbury towards the expenses of the ensuing Country meeting, and already paid over to the credit of the Society's account.

A Committee has been formed for the purpose of considering the best mode in which the collection of subscriptions can be effected by means of paid collectors, and on their report the Council have resolved to try the experiment of such local collection within districts comprised by the counties of Bedford, Buckingham, Cambridge, Essex, Hertford, Huntingdon, and Northampton: the Committee, accordingly, having arranged the practical details by means of which such resolution may be systematically carried out.

3. The Council have invited the Members at large to nominate at the General May Meeting such judges for the Country meetings as they recommend for the several classes of stock and implements; and they have appointed Committees for each of those departments respectively to examine such lists of nominations, and report the result to the Council, by whom the appointment will be finally made. As no exhibitor will be allowed to take any part in the nomination or appointment of judges for the classes in which he competes, the Council trust that this extended

mode of selecting their judges will meet with the approbation of the exhibitors.

4. The Committee, to whom the Council confided the consideration of the mode by which a trial of tile-machines, ploughs, and drills, subsequently to the period of the Country meeting, and under circumstances best adapted to the testing of their respective merits, could be most advantageously effected, have reported the following recommendations, which the Council have adopted:—

(1.) That the tile-machines shall be tried by the judges at Shrewsbury; and such of them as the judges may think worthy shall be selected by them for further trial; such trial to be made by a visit on the part of the judges to some one tile-yard pointed out by each inventor respectively, and subsequently elsewhere as the judges may see fit.

(2.) That the judges shall select at the Shrewsbury trial so many ploughs as they think fit for subsequent trial; and the ploughs so selected shall be at the disposal of the stewards and judges.

(3.) That the rules for the selection and trial of ploughs shall apply also to drills.

(4.) That the winning implement of the previous year shall be included in these subsequent trials.

(5.) That the makers and inventors of the implement shall be entitled to attend, at their own expense, at some one of the trials, of which notice shall be given to them.

(6.) That if the judges select for trial at the Shrewsbury meeting the plough of any exhibitor, and the exhibitor wish to substitute for it any other plough exhibited by him at the same meeting, such other plough shall be tried at the Shrewsbury meeting, but not elsewhere unless the judges think fit; but the judges shall also try, if they think fit, the plough originally selected by them.

(7.) That the judges shall report on the reserved implements to the first Council in November.

5. At the suggestion of the British Association for the Advancement of Science, the Council have resolved that a chemical analysis of the ashes of plants grown in different localities and on different soils throughout the kingdom shall be made at the expense of the Society, and they have voted the sum of 350*l.* towards carrying out that desirable and important object. At the request of the Stalham Farmers' Club, the Council have instructed their consulting chemist, Dr. Playfair, to analyze at the expense of the Society specimens of the soil and subsoil of a wheat-field in Norfolk remarkable for its productiveness.

The Journal Committee have reported the following awards to the authors of prize essays, and also a list of subjects of prizes amounting to 310*l.* for the reports and essays of next year:—

AWARDS.

The Prize of TWENTY SOVEREIGNS to Mr. HENRY WHITE, of Warington, for his Essay on the Details of making Cheshire Cheese.

The Prize of FIFTY SOVEREIGNS to Mr. R. W. CORRINGHAM, of Bolham Hall, near Retford, for his Report on the Farming of Nottinghamshire.

The Prize of FIFTY SOVEREIGNS to Mr. W. F. KARKEEK, of Truro, for his Report on the Farming of Cornwall.

The Prize of FIFTY SOVEREIGNS to Mr. GEORGE BUCKLAND, of Benenden, for his Report on the Farming of Kent.

The Prize of TWENTY SOVEREIGNS to Mr. JOHN WATSON, jun., of Kendal, for his Essay on Reclaiming Heath Land.

The Prize of TEN SOVEREIGNS to Mr. EDWARD BOWLY, of Cirencester, for his Essay on the Advantages of One-horse Carts.

The Prize of TWENTY SOVEREIGNS to Mr. JAMES GRIGOR, of Norwich, for his Essay on Fences.

The Prize of TEN SOVEREIGNS to Mr. GEORGE DOBITO, of Kirtling Hall, Newmarket, for his Essay on Fattening Cattle.

The Prize of TWENTY SOVEREIGNS to Mr. FREDERICK WILLIAM ETHEREDGE, of Park Street, Westminster, for his Essay on the cheapest and best Method of establishing a Tile-yard.

The Prize of TWENTY SOVEREIGNS for an Account of the best Experiment in Agriculture to Mr. JOHN HANNAM, of North Deighton, near Wetherby, for his Essay on the Theory and Application of Bone Manure.

NEW PRIZES.

On the Agriculture of North Wales	£50
On the Agriculture of the West Riding of Yorkshire	50
On the Agriculture of Cambridgeshire	50
On the Advantages or Disadvantages of breaking up Grass-land	50
On the Improvement of the Condition of the Agricultural Labourer, so far as it may be promoted by private Exertion without legislative Enactment	30
On keeping Farm Accounts	10
On Employment by the Piece	20
On Peat-Charcoal as a Manure	10
On Sulphuric Acid and Bones	10
On White Mustard	10
On the St. John's Day Rye	10
On draining Running Sands	10

The Council have received from the Journal Committee a highly favourable opinion of the character of the Essays sent in this year to compete for the various prizes offered by the Society.

The Council have reason to anticipate from the extensive entry already made of implements, and the numerous applications for certificates of stock, that the Country meeting of the present year, to be held at Shrewsbury for the North Wales District in the week commencing the 14th of July next, will be fully as large and satisfactory as on former occasions.

The Council have accepted the invitation of a public meeting convened at Newcastle-upon-Tyne, to hold the Country meeting for the Northern District at that town in the year 1846.

The Council, in conclusion, have the satisfaction, at the close of the seventh year of the establishment of the Society, of congratulating the Members on the steady advance of the Society in the accomplishment of its various practical objects, and the gradual development of its prospects and resources: among which

the Council cannot help alluding to the establishment of local societies for the discussion of agricultural subjects, which they feel have mainly originated from the attention which the exertions of this Society have attracted to the improvement of agriculture, and which the Council are confident will lead to the most beneficial results.

By order of the Council,

(Signed) JAMES HUDSON,
Secretary.

General Meetings of 1845-6.

THE ANNUAL COUNTRY MEETING, at Shrewsbury, in 1845.
Principal Day of the Show, Thursday, July 17.

THE GENERAL DECEMBER MEETING, in London, on Saturday,
December 13, 1845.

THE GENERAL MAY MEETING, in London, on Friday, May 22,
1846.

THE ANNUAL COUNTRY MEETING, at Newcastle-upon-Tyne,
in 1846.

COTTAGE ECONOMY.—Mr. Main's article on Cottage Gardening, and Mr. Burke's compilation on Cottage Economy and Cookery, have each been reprinted from the Journal in a separate form, for cheap distribution. Either or both of these tracts may be obtained by members at the rate of 1s. per dozen copies, on their enclosing to the Secretary a Post-office money-order for the number required; at the same time stating the most eligible mode of conveyance by which the copies can be transmitted to their address. They are also sold to the public at 2d. each, by the Society's Publisher, Mr. MURRAY, 50, Albemarle Street, London.

VOLUMES OF THE JOURNAL.—The first Volume of the Journal consists of *four* parts, the second and third Volumes of *three* parts each (the second and third parts of the third Volume being comprised in a double number), and the fourth of *two* parts. The Journal is now published half-yearly, namely, the first half-volume for each year about the end of June, and the second about the end of December.

SUBSCRIPTIONS may be paid to the Secretary, in the most direct and satisfactory manner, by means of Post-office orders, to be obtained on application at any of the principal Post-offices throughout the kingdom. They are due in advance, for each year, on the 1st of January; and are in arrear if unpaid by the 1st of June ensuing. The system of local collection is about to be tried in the counties of Bedford, Buckingham, Cambridge, Essex, Hertford, Huntingdon, and Northampton. No Member is entitled to the Journal or to any other privileges of the Society, whose subscription is in arrear.

Statement of Accounts.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Half-yearly Account ending 31st December, 1844.

RECEIPTS.		£.	s.	d.	PAYMENTS.		£.	s.	d.
Balance in the hands of the Bankers, June 30th, 1844		•	3456	19 8	Permanent Charges	•	•	•	•
Ditto in the hands of the Secretary, June 30th, 1844		•	15	17 11	Taxes	•	•	•	260 12 6
Dividends on Stock	•	•	•	•	Establishment	•	•	•	13 15 2
Life Compositions of Members	•	•	189	9 0	Postage and Carriage	•	•	•	564 0 8
Annual Subscriptions of Governors	•	•	265	0 0	Advertisements	•	•	•	17 5 4
Annual Subscriptions of Members	•	•	182	0 0	Expenses of Journal	•	•	•	8 15 0
Sale of Journal	•	•	1545	4 0	Prizes	•	•	•	928 15 6
Sale of Cottage Tracts	•	•	116	7 6	Payments on account of the Country Meetings during the half-year	•	•	•	1349 15 0
Receipts on account of the Country Meetings during the half-year	•	•	8	2 5	Miscellaneous Payments	•	•	•	2060 17 3
			357	16 10	Re-payment to Messrs. Glyn & Co. of an amount lodged by them in the hands of Messrs. Drummond by mistake	•	•	•	13 8 6
					Balance in the hands of the Bankers, December 31st, 1844	•	•	•	25 0 0
					Ditto in the hands of the Secretary, December 31st, 1844	•	•	•	883 10 9
									11 1 8
									£6136 17 4
(Signed)	THOMAS RAYMOND BARKER, Chairman.				Examined and audited this 16th day of May, 1845.				
	C. B. CHALLONER.				(Signed)	CHAS. TAWNEY.			
						THOMAS KNIGHT.			
						C. H. TURNER.			

ESSAYS AND REPORTS ON VARIOUS SUBJECTS.

Prizes for 1846.

PRIZE ESSAYS.

I. FARMING OF NORTH WALES.

FIFTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Report on the Farming of North Wales.

Competitors will be expected to describe the different varieties of soil which prevail in North Wales, and the quality and extent of the waste lands; also the ordinary modes of farming and courses of cropping adopted according to its various districts; and to state how far any peculiar practices in its husbandry are or are not justified by peculiarities of soil or climate. They will also be expected to state what improvements have been made in the farming of North Wales since the Report of the Rev. Walter Davies in the year 1810; and especially to point out what further improvements ought to be effected, either by better farming on land already cultivated, or by converting land now waste into arable, pasture, or catch-meadow.

N.B. The writers of County Reports are requested, if possible, not to exceed the length of 40 or at most 50 printed pages.

II. FARMING OF WEST RIDING OF YORKSHIRE.

FIFTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Report on the Farming of the West Riding of Yorkshire.

Competitors will be expected to describe the different varieties of soil which prevail in the West Riding of Yorkshire, and the quality and extent of the waste lands; also the ordinary modes of farming and courses of cropping adopted according to its various districts; and to state how far any peculiar practices in its husbandry are or are not justified by peculiarities of soil or climate. They will also be expected to state what improvements have been made in the farming of the West Riding of Yorkshire since the Report of Robert Brown in the year

1799; and especially to point out what further improvements ought to be effected.

III. FARMING OF CAMBRIDGESHIRE.

FIFTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Report on the Farming of the County of Cambridge.

Competitors will be expected to describe the different varieties of soil which prevail in the county, the ordinary modes of farming and courses of cropping adopted accordingly in its various districts; to describe the great works of drainage; and to state how far any peculiar practices in its husbandry are or are not justified by peculiarities of soil or climate. They will also be expected to state what improvements have been made in the farming of Cambridgeshire since the Report of the Rev. W. Gooch in the year 1813; and especially to point out what further improvements ought to be effected, either by better farming on land already cultivated, by improvement of the general drainage, or by taking new land into cultivation.

IV. ON THE ADVANTAGES AND DISADVANTAGES OF BREAKING UP GRASS-LAND.

FIFTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Report on the Advantages or Disadvantages of Breaking up Grass-land.

Competitors will be expected to state the advantages so arising to the labourer, the farmer, the landlord, and the public, from increase of employment, of profit, of rent, and of food.

Grass-lands must be divided under at least three heads—of down-lands, cold pastures, and good meadow or grazing ground.

The mode proposed for breaking up and tilling each kind of grass-land must be described.

V. ON THE IMPROVEMENT OF THE CONDITION OF THE AGRICULTURAL LABOURER.

THIRTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Essay on the Improvement of the Condition of the Agricultural Labourer, so far as it may be promoted by private exertion, without legislative enactment.

VI. ON THE BEST METHOD OF KEEPING FARMING ACCOUNTS.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Essay on the Keeping of Farming Accounts.

VII. ON MEASURE-WORK.

TWENTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best account of Measure-Work, locally known as Task, Piece, Job, or Grate Work, in its application to Agricultural Labour: detailing the various descriptions of such work to which any system of measure is applicable; the rates usually paid, and the sum usually earned in a given time; and comparing the effects of such payment with those arising from the payment of wages by time, on the direct interest of the employer, and especially on the habits, comforts, and general condition of the employed: the whole deduced, as much as possible, from personal experience; and affording to parties unacquainted with the practice the means of estimating its advantages, and the information necessary for carrying it out.

VIII. PEAT CHARCOAL AS A MANURE FOR TURNIPS OR
OTHER CROPS.

TWENTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Essay on Peat Charcoal as a Manure for Turnips and other Crops.

Competitors will be required to attend to the following points:—

1. Quality of peat.
2. Mode of making the heaps and burning the charcoal.
3. Quantity produced from a given measure of peat.
4. Quantity applied per acre, and effect, in comparison with peat-ashes, and with some other manures.

N.B. This Essay need not be sent in before the 1st of December, 1846.

IX. THE ST. JOHN'S-DAY RYE.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for the best account of the St. John's-day Rye.

Competitors will be required to attend to the following points:—

1. Times of sowing, and cutting or feeding off in autumn and spring.
2. Comparison of this variety with the common rye.
3. Estimated amount of feed.

N.B. This Essay need not be sent in before the 1st of October, 1846.

X. ACID WITH BONES.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for the best account of the use of Acid with Bones.

Competitors will be required to attend to the following points:—

1. State of bones.
2. Proportion of sulphuric or muriatic acid to a given weight of bones.
3. Proportion of water mixed with the acid.

4. Mode of mixing the bones with the acid, and of preparing the compost.
5. Effect of various quantities applied in combination or comparison with common bones and other known manures.

XI. WHITE MUSTARD.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for the best account of the Cultivation of White Mustard.

Competitors will be required to attend to the following points:—

1. Quality of land on which sown.
2. Mode and time of sowing, and quantity of seed.
3. Period of maturity, according to the season of the year.
4. Application of crop, whether as green manure or to be fed off.

XII. DRAINAGE OF RUNNING SANDS.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for a description of the best method of Draining Running Sands.

These Essays (with the exception of those in Classes VIII. and IX.) must be sent to the Secretary, at 12, Hanover Square, London, on or before March 1st, 1846.

RULES OF COMPETITION FOR PRIZE ESSAYS.

1. All information contained in Prize Essays shall be founded on experience or observation, and not on simple reference to books, or other sources.
2. Drawings, specimens, or models, drawn or constructed to a stated scale, shall accompany writings requiring them.
3. All competitors shall enclose their names and addresses in a cover, on which only their motto, and the subject of their Essay, and the number of that subject in the Prize list of the Society, shall be written.
4. The President or Chairman of the Council for the time being, shall open the cover on which the motto designating the Essay to which the Prize has been awarded is written, and shall declare the name of the author.
5. The Chairman of the Journal Committee shall alone be empowered to open the motto-paper of such Essays, not obtaining the Prize, as he may think likely to be useful for the Society's objects, with a view of consulting the writer confidentially as to his willingness to place such paper at the disposal of the Journal Committee.
6. The copyright of all Essays gaining prizes shall belong to the Society, who shall accordingly have the power to publish the whole or any part of such Essays; and the other Essays will be returned on the application of the writers; but the Society do not make themselves responsible for their loss.
7. The Society are not bound to award a prize unless they consider one of the Essays deserving of it.
8. In all reports of experiments the expenses shall be accurately detailed.
9. The imperial weights and measures only are those by which calculations are to be made.
10. No prize shall be given for any Essay which has been already in print.
11. Prizes may be taken in money or plate, at the option of the successful candidate.
12. All Essays must be addressed to the Secretary, at the house of the Society.

Royal Agricultural Society of England.

1845—1846.

President.

THE RIGHT HON. LORD PORTMAN.

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Braybrooke, Lord
Clive, Hon. Robert Henry, M.P.
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JAMES HUDSON, 12, *Hanover Square*, London.

Consulting Chemist—Dr. LYON PLAYFAIR, Museum of Economic Geology, Craig's Court, Charing Cross.

Consulting Engineer—JOSIAH PARKES, C.E., 11, Great College Street, Westminster.

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STEVENSON, The Hon. ANDREW, Washington.

VAN DE WEYER, M. SYLVIAN, Belgian Minister.

Royal Agricultural Society of England.

GENERAL MEETING,

12, HANOVER SQUARE, SATURDAY, DECEMBER 13, 1845.

REPORT OF THE COUNCIL.

THE Council have to report to the Members at their present General Meeting the result of their consideration on the three following principal subjects during the past half-year, namely:—

1. The Annual Country Meetings;
2. The Finances of the Society; and
3. The Potato Disease.

ANNUAL COUNTRY MEETINGS.

The following comparative statement of the entries of stock and implements at each of the Country Meetings already held, and of the amount of receipts and expenditure on each occasion, will furnish, at a single view, the requisite data for estimating the extent of the several Meetings, and their respective charge on the general funds of the Society:—

ENTRIES.					
	Stock.	Implements.	Receipts.	Expendi- ture.	Excess of Expendi- ture.
			£	£	£
1839, Oxford . . .	249	23	2394	2688	294
1840, Cambridge . .	352	36	3416	3589	173
1841, Liverpool . .	319	312	4106	5052	946
1842, Bristol . . .	510	455	4202	4775	573
1843, Derby . . .	730	508	3390	5090	1700
1844, Southampton .	575	948	4929	5736	807
1845, Shrewsbury .	437	942	3662	5166	1504

It will be seen by this statement that the last Country Meeting of the Society, held at Shrewsbury, exceeded the first Meeting, held at Oxford, by double the entries of stock, and more than forty times the entries of implements; while the expenses required at the Shrewsbury Meeting, to provide the increased amount of accommodation, have been only double those of the Oxford Meeting. But the number of persons who visited the Show-yard at Shrewsbury being, from local causes, much less proportionably than at Oxford, a heavy excess of expenditure over the receipts of the Shrewsbury Meetings has become chargeable on the funds of the Society. If, however, the multitudes who had thronged the former Country Meetings, in localities more accessible and more thickly populated than that of the North Wales District of the Society, in which Shrewsbury is situate, were wanting at the Society's recent Country Meeting in that town, the Council feel that a great principle of the Society has been carried out, in having held one of their Country Meetings in a district purely agricultural, remote from opportunities of direct information as to means of improvement, of personal inspection of the various breeds of stock, and of the peculiar character of the implements of distant districts. While, however, the assemblage that formed the Shrewsbury Meeting was less than on previous occasions, it comprised within its numbers a large proportion of the most eminent agriculturists from every part of the kingdom, including distinguished foreign visitors, and a deputation from the duchy of Mecklenburg-Schwerin; and the splendid exhibition of Hereford cattle, and the quality of the show generally, both of stock and implements, constituted an exhibition fully equal in merit and intrinsic excellence to the more numerously attended meetings of previous years. The trial of Implements, both at Shrewsbury, and subsequently at Pusey in Berkshire, has proved highly satisfactory to the Stewards and Judges of that department, who have, however, reported to the Council that the trial made on the spot, and at the time of the Meeting at Shrewsbury, was fully adequate to the purpose, and might have spared the delay, expense, and trouble occasioned by a subsequent trial. In acknowledgment of

the obligations which the Society owed to the Mayor and Corporation of Shrewsbury; to Mr. Edward Haycock, and the Local Committee; to Mr. Isaac Taylor, of Monkmoor; to Mr. Pusey, M.P.; to the Railway Companies, and to the Commissioners of Police, the Council have transmitted to those parties respectively a vote of their best thanks.

The Council have appointed Committees for taking into consideration the following questions respectively referred to them:—

1. For recommending the best method of providing for the personal accommodation of the Judges, and for regulating the future rate of remuneration for their services.

2. For reporting to the Council the most suitable rotation of districts, to commence in 1848, for the Annual Country Meetings of the Society, to be adopted on the termination of the present schedule, which ends in 1847; and

3. For ascertaining, in conjunction with the legal advisers of the Society, the security to be provided in future against alleged infringement of patent rights, in making use of implements selected by the Judges for trial.

The Cattle Prize Sheet for the Newcastle Meeting, as arranged in the month of June last, according to the bye-law, in which an increase is made in the amount of the principal prizes, has been already published; and the list of prizes to be offered for implements at Newcastle has also been arranged. The Council are gratified to find, from the numerous applications received from various parts of the kingdom, soliciting the Society to hold its Country Meeting in each of their respective districts, that the effects resulting from the system of a succession of districts adopted by the Council have not only proved to be of a most practical and beneficial character, but that they are duly estimated by the country at large. For the accommodation of the exhibitors, they have decided on further arrangements to be made with the auctioneer at the sale of stock; and in order to enable the consulting engineer to have increased facilities for drawing up his Report on the exhibition and trial of implements, they have released him from the duties of acting as a judge, for the purpose of allowing him to

devote his attention more exclusively to a detailed examination of the principles, construction, and practical working of the implements exhibited.

The Council have received from the Judges appointed for the trial of wheat selected at the Southampton Meeting, their respective reports on its cultivation, along with other local varieties.

The Committee having reported to the Council that unexpected difficulties had arisen in effecting the analyses of the ashes of plants, for which the Council had voted a sum of money, the Council have requested the Committee to ascertain the actual state of the investigation, and favour them with a Report on the subject.

FINANCES.

The following statement of the number of members and the amount of income and expenditure, from the year of the Oxford Meeting to that of the Southampton Meeting inclusively, will show the corresponding relation of each of these particular heads of inquiry during the period of the Society's past history:—

	Members.	Income.	Expenditure.
1838.	} 2172	£7446	£6941
1839.			
1840.	4262	5001	4040
1841.	5382	6028	5150
1842.	6500	6236	5699
1843.	6903	7907	6906
1844.	6827	9291	9070

The arrears of subscription at the present time are as follows:—

1841	£ 336
1842	636
1843	1141
1844	1702
1845	2987

Total £6802

The total number of members in arrear is 2902.

1915 $\frac{1}{2}$ have been discharged from the arrear account since the last General Meeting in May. Since that date 264 new members have been elected, 42 have died, and 316 have been struck off the List; and the Society now consists of the following Members:—

Life Governors	94
Annual Governors	198
Life Members	527
Annual Members	5899
Honorary Members	15
Total	<hr/> 6733

The Council having ordered the List of the Society to be printed for the use of the members, it is now in the press, and will appear with the ensuing part of the Journal: and they beg to state that the members of the Society who receive the List and Journal will render a service to the Society by informing the Secretary of any errors they may observe in that List.

POTATO DISEASE.

His Grace the Duke of Northumberland, one of the vice-presidents of the Society, having placed at the disposal of the Society the sum of 100*l.*, to be appropriated to such purpose for promoting the objects of the Society as the Council might decide; the Council, with the Duke of Northumberland's entire concurrence and approval, have resolved to divide this donation into three prizes, to be offered for the best Essays on the potato disease and its history; such Essays to be sent in to the secretary of the Society by the 1st of June, 1846: the Prize Essays in that class being reserved for announcement and reading at the Newcastle Meeting, namely:—

I. PRIZE of 50*l.* for the best Essay on the remedy for the potato disease, and on its treatment in the various stages of planting, growth, and preservation.

Competitors for this prize will be required to furnish information under the following heads:—

An account of the growth of the potato during the last year, with reference to the nature of the season.

The nature and cause of the disease.

The remedies for the disease; explaining the principles on which the remedy is founded.

The treatment of the potato in planting, both from the tubers and from the seed, and in various stages of its growth.

The mode of pitting and preserving potatoes in ordinary seasons, with the principles upon which any improved plan may be founded.

II. PRIZE of 20*l.* for the second best Essay on the same subject.

III. PRIZE of 30*l.* for the best history of the disease at the present time affecting the potato; involving a condensed detail of facts developed by experiments.

Competitors for this prize will be required to furnish information on the following points:—

The year in which the disease first appeared in this or other countries.

The history of the disease in the potato in the United Kingdom, and in other parts of the world, with particular reference to authentic returns regarding any peculiarity of season or seasonal variations.

On the methods for retarding the disease.

On the methods proposed for extracting the nutritive ingredients of diseased potatoes.

Dr. Lyon Playfair, the consulting chemist to the Society, having kindly consented to deliver two Lectures on the Potato Disease before the members, on the occasion of their present General Meeting, the Council, at the suggestion of the Journal Committee, directed all papers on that subject to be submitted to Dr. Playfair's inspection previously to their future consideration by that Committee; and the Royal Institution of Great Britain having liberally placed their Theatre at the disposal of the Council for the delivery of these Lectures, the President, in the name of the Council and on behalf of the Society, has expressed to Dr. Lyon Playfair his best thanks for the important practical Lectures delivered to the members on that occasion; and to the Managers of the Royal Institution of Great Britain his best thanks for the favour they have shown to the Society, by the courtesy and liberality of the grant of their Theatre, and their cordial co-operation in thus aiding the Society in the prosecution of its objects of public utility.

The Journal Committee, since the last General Meeting, have reported the following awards of Prizes for Essays:—

Mr. OWEN OWEN ROBERTS, of Bangor, North Wales; Lord Kenyon's Prize of 20*l.* for the best Essay on Gorse as the food of Cattle, Horses, and Sheep.

Mr. JOHN ROALS, of Brendon Farm, Wiveliscombe, Somersetshire; the Society's Prize of 20*l.* for the best Essay on Catch-Meadows.

The House Committee have reported the execution of the various alterations and repairs required in the Society's house; the progress of the plans for the arrangement of the specimens of wheat, and of the models and implements presented to the Society; and the completion of alphabetical and classed catalogues of the books in the library.

A vacancy having occurred in the list of the Trustees of the Society, by the lamented death of John Charles, Earl Spencer, the Council, in unanimously electing Frederick, Earl Spencer, to fill that office, have availed themselves of the opportunity of recording on their minutes an expression of their sincere regret at his loss, and their deep sense of his private virtues, and of the valuable services he had so uniformly and unweariedly rendered to the Society in promoting every practical object connected with its welfare, and the general advancement of agricultural improvement. They have elected Mr. Grey, of Dilston, a member of the Council, in the vacancy caused by the transfer of Frederick, Earl Spencer, to the list of trustees.

The Council beg, in conclusion, to congratulate the members on the steady progress of the Society in the advancement of its various objects; and on the distinct evidences, throughout the country, of the impulse given to the national cause of agricultural improvement by its movements. They are more and more convinced, as their labours proceed, that, in every attempt to establish sound principles of practical agriculture, the indispensable necessity exists of combining the application of abstract reasonings with a careful collection of facts, aided by that discussion of the rich store of practical experiment to which every member of the Society, from within the sphere of his own local observation, has it in his power more or less to contribute, and especially at the weekly Councils, which will be held as usual, during the session of the Society, from February to August.

By order of the Council,

(Signed)

JAMES HUDSON,
Secretary.

General Meetings of 1846.

THE GENERAL MAY MEETING, in London, on Friday, May 22, 1846.

THE ANNUAL COUNTRY MEETING, at Newcastle-upon-Tyne, in 1846.

THE DECEMBER GENERAL MEETING, in London, on the Saturday of the Smithfield Club Show Week, 1846.

COTTAGE ECONOMY.—Mr. Main's article on Cottage Gardening, and Mr. Burke's compilation on Cottage Economy and Cookery, have each been reprinted from the Journal in a separate form, for cheap distribution. Either or both of these tracts may be obtained by members at the rate of 1s. per dozen copies, on their enclosing to the Secretary a Post-office money-order for the number required; at the same time stating the most eligible mode of conveyance by which the copies can be transmitted to their address. They are also sold to the public at 2d. each, by the Society's Publisher, Mr. MURRAY, 50, Albemarle Street, London.

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ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Half-yearly Account ending 30th June, 1845.

RECEIPTS.		PAYMENTS.	
	£. s. d.		£. s. d.
Balance in the hands of the Bankers, 1st January, 1845	883 10 9	Investment in the purchase of Stock	512 10 0
Ditto in the hands of the Secretary, 1st January, 1845	11 1 8	Permanent Charges	270 12 6
Dividends on Stock	121 9 7	Taxes and Rates	21 2 5
Life Compositions of Governors	100 0 0	Establishment	709 13 9
Life Compositions of Members	294 0 0	Postage and Carriage	38 18 4
Annual Subscriptions of Governors	843 10 0	Advertisements	7 16 4
Annual Subscriptions of Members	3578 2 0	Expenses of Journal	951 11 4
Sale of Journal	155 13 7	Prizes	314 8 0
Sale of Cottage Tracts	5 17 4	On account of Country Meetings	311 14 7
On account of Country Meetings	1093 14 0	Subscriptions repaid	24 1 0
		Miscellaneous Payments	7 9 11
		Balance in the hands of the Bankers, 30th June, 1845	3912 11 7
		Ditto in the hands of the Secretary, 30th June, 1845	4 9 2
	<u>£7086 18 11</u>		<u>£7086 18 11</u>

Examined and audited this 12th day of December, 1845.

(Signed) THOMAS RAYMOND BARKER, Chairman.
HENRY BLANSHARD,
PORTMAN, President.

(Signed) CHAS. TAWNEY.
THOMAS KNIGHT.
C. H. TURNER.

Meeting at Shrewsbury.

PRINCIPAL DAY OF THE SHOW, JULY 17, 1845.

AWARD OF PRIZES.

CATTLE: I. *Short-Horns.*

JAMES BANKS STANHOPE, of Revesby Abbey, near Boston, Lincolnshire: the Prize of THIRTY SOVEREIGNS, for his 2 years and 8 months-old Short-horned Bull; bred by John Parkinson, of Ley Fields, near Newark.

JOHN FORREST, of Stretton, Cheshire: the Prize of FIFTEEN SOVEREIGNS, for his 6 years and 4 months-old Pure Short-horned Bull; bred by Thomas Forrest, of Stretton.

CAPEL HANBURY LEIGH, of Pontypool Park, Monmouthshire: the Prize of TWENTY SOVEREIGNS, for his 2 years 5 months and 16 days-old Short-horned Bull; bred by himself.

JAMES BANKS STANHOPE, of Revesby Abbey, near Boston: the Prize of FIFTEEN SOVEREIGNS, for his 4 years and 3 months-old Short horned Cow; bred by John Booth, of Killerby.

VISCOUNT HILL, of Hawkstone, near Shrewsbury: the Prize of FIFTEEN SOVEREIGNS, for his 2 years 9 months and 27 days-old Short-horned Heifer; bred by R. M. Jaques, of Easby Abbey, near Richmond, Yorkshire.

EDWARD LAKIN, of Beauchamps Court, near Worcester: the Prize of TEN SOVEREIGNS, for his 1 year and 11 months-old Short-horned Heifer; bred by himself.

VISCOUNT HILL, of Hawkstone: the Prize of TEN SOVEREIGNS, for his 9 months and 12 days-old Short-horned Bull-Calf; bred by Richard Almond, of Orrell, near Wigan.

CATTLE: II. *Herefords.*

THOMAS SHERIFF, of Coxall, near Brampton-Brian, Herefordshire : the Prize of THIRTY SOVEREIGNS, for his 5 years 6 months and 21 days-old Hereford Bull; bred by himself.

EDWARD GOUGH, of Gravel Hill, near Shrewsbury : the Prize of FIFTEEN SOVEREIGNS, for his 2 years and 7 months-old Herefordshire Bull; bred by the late Edward Gough, of Gravel Hill.

EDWARD URWICK, of Felton, near Ludlow, Salop : the Prize of TWENTY SOVEREIGNS, for his 1 year and 7 months-old Hereford Bull; bred by himself.

JOHN NELSON CARPENTER, of Eardisland, near Leominster, Herefordshire : the Prize of FIFTEEN SOVEREIGNS, for his 3 years 8 months and 10 days-old Hereford Cow; bred by himself.

JOHN NELSON CARPENTER, of Eardisland : the Prize of FIFTEEN SOVEREIGNS, for his 2 years 7 months and 24 days-old Hereford in-calf Heifer; bred by himself.

THOMAS LOCKLEY MEIRE, of Cound Arbor, near Shrewsbury : the Prize of TEN SOVEREIGNS, for his 1 year and 6 months-old Hereford Heifer; bred by himself.

JOHN THOMAS, of Cholstrey, near Leominster, Herefordshire : the Prize of TEN SOVEREIGNS, for his 10 months-old Hereford Bull-Calf; bred by himself.

CATTLE: III. *Devons.*

THOMAS WHITE FOURACRE, of Durston, near Taunton, Somersetshire : the Prize of THIRTY SOVEREIGNS, for his 4 years and 7 months-old Devon Bull; bred by William Stone, of Dulverton, Somersetshire.

JAMES QUARTLY, of Molland, near South Molton, Devonshire : the Prize of TWENTY SOVEREIGNS, for his 2 years and 5 months-old Devon Bull; bred by himself.

JAMES QUARTLY, of Molland : the Prize of FIFTEEN SOVEREIGNS, for his 6 years and 3 months-old North-Devon Cow; bred by himself.

GEORGE TURNER, of Barton, near Exeter, Devonshire : the Prize of FIFTEEN SOVEREIGNS, for his 2 years and 6 months-old Pure North-Devon in-calf Heifer; bred by himself.

GEORGE TURNER, of Barton, near Exeter, Devonshire : the Prize of TEN SOVEREIGNS, for his 1 year and 6 months-old Pure North-Devon Heifer; bred by himself.

GEORGE TURNER, of Barton, near Exeter : the Prize of TEN SOVEREIGNS, for his 7 months and 2 weeks-old Pure North-Devon Bull-Calf; bred by himself.

CATTLE: IV. *Any Breed* (not qualified to compete in the foregoing Classes).

HON. M. W. B. NUGENT, of Higham Grange, near Hinckley, Leicestershire: the Prize of TWENTY SOVEREIGNS, for his 4 years and 2 months-old Pure Leicester or Long-horned Bull; bred by H. T. Slingsby, of Foleshill Hall, Coventry.

JOHN LEES BROWN, of Farewell, near Lichfield, Staffordshire: the Prize of TEN SOVEREIGNS, for his 3 years and 6 months-old Pure Long-horned Bull; bred by himself.

HON. M. W. B. NUGENT, of Higham Grange, near Hinckley: the Prize of FIFTEEN SOVEREIGNS, for his 21 years-old Pure Leicester or Long-horned Cow; bred by W. Gibbs, of Henley-in-Arden.

HON. M. W. B. NUGENT, of Higham Grange: the Prize of TEN SOVEREIGNS, for his 2 years 10 months and 18 days-old Pure Leicester or Long-horned Heifer; bred by himself.

HON. M. W. B. NUGENT, of Higham Grange: the Prize of TEN SOVEREIGNS, for his 1 year and 9 months-old Pure Leicester or Long-horned Heifer; bred by himself.

HORSES.

HENRY CROSSE, of Boyton Hall, Stowmarket, Suffolk: the Prize of THIRTY SOVEREIGNS, for his 9 years-old Cart Stallion; bred by the late William Crosse, of Little Finborough Hill, Suffolk.

HILLYER REEVE, of Wroughton, near Swindon, Wiltshire: the Prize of FIFTEEN SOVEREIGNS, for his 6 years-old Cart Stallion; bred by J. Henshaw, of Aston, Derbyshire.

FREDERICK THOMAS BRYAN, of Knossington, near Oakham, Rutlandshire: the Prize of FIFTEEN SOVEREIGNS, for his 2 years-old Cart Stallion; bred by Richard Brown, of Elsworth, Cambridgeshire.

VISCOUNT HILL, of Hawkstone, near Shrewsbury: the Prize of TWENTY SOVEREIGNS, for his Cart Mare and Foal; the sire of the Foal being his own property, and the Mare being bred by the late Viscount Hill, of Hardwicke Grange.

GEORGE TOWNSEND, of Sapcote Fields, near Hinckley, Leicestershire: the Prize of TEN SOVEREIGNS, for his Cart Mare and Foal. The sire of the Foal having been the property of W. Hipwell, of Swinford, Leicestershire: the breeder of the Mare unknown.

LORD ST. JOHN, of Melchbourne, near Kimbolton: the Prize of TEN SOVEREIGNS, for his 2 years-old Filly, for agricultural purposes; bred by himself.

JOHN BISHTON MINOR, of Astley House, near Shrewsbury: the Prize of THIRTY SOVEREIGNS, for his 9 years-old Thorough-bred Stallion; bred by the Hon. Sidney Herbert, M.P., of Wilton House, Wiltshire. Got by Sultan; dam Clara, by Filho da Puta.

SHEEP: I. Leicesters.

THOMAS EDWARD PAWLETT, of Beeston, near Biggleswade, Bedfordshire: the Prize of THIRTY SOVEREIGNS, for his 16 months-old Leicester Ram; bred by himself.

SAMUEL BENNETT, of Bickerings Park, near Woburn, Bedfordshire: the Prize of FIFTEEN SOVEREIGNS, for his 16 months-old Pure New Leicester Ram; bred by himself.

ROBERT BURGESS, of Cotgrave Place, near Nottingham: the Prize of THIRTY SOVEREIGNS, for his 65 months-old Pure Leicester Ram; bred by himself.

ROBERT BURGESS, of Cotgrave Place: the Prize of FIFTEEN SOVEREIGNS, for his 41 months-old Pure Leicester Ram; bred by himself.

JOHN GREGORY WATKINS, of Woodfield, near Worcester: the Prize of TEN SOVEREIGNS, for his pen of 16 months-old Pure Leicester Shearling Ewes; bred by himself.

GEORGE TURNER, of Barton, near Exeter: the Prize of FIVE SOVEREIGNS, for his pen of 16 months old Leicester Shearling Ewes; bred by himself.

SHEEP: II. Southdowns.

JONAS WEBB, of Babraham, near Cambridge: the Prize of THIRTY SOVEREIGNS, for his 16 months-old Southdown Ram; bred by himself.

His Grace the DUKE of RICHMOND, of Goodwood, near Chichester, Sussex: the Prize of FIFTEEN SOVEREIGNS, for his 16 months-old Southdown Ram; bred by himself.

His Grace the DUKE of RICHMOND, of Goodwood: the Prize of THIRTY SOVEREIGNS, for his 28 months-old Southdown Ram; bred by himself.

STEPHEN GRANTHAM, of Stoneham, near Lewes, Sussex: the Prize of FIFTEEN SOVEREIGNS, for his 40 months-old Southdown Ram; bred by himself.

His Grace the DUKE of RICHMOND, of Goodwood: the Prize of TEN SOVEREIGNS, for his pen of 16 months-old Southdown Shearling Ewes; bred by himself.

DAVID BARCLAY, M.P., of Eastwick Park, near Leatherhead, Surrey : the Prize of FIVE SOVEREIGNS, for his pen of 16 months-old Pure Southdown Shearling Ewes ; bred by himself.

SHEEP : III. *Long-Wools* (not Leicesters).

EDWARD HANDY, of Sevenhampton, near Andoversford, Gloucestershire : the Prize of THIRTY SOVEREIGNS, for his 16 months-old Improved Cotswold Ram ; bred by himself.

CHARLES LARGE, of Broadwell, near Lechlade, Gloucestershire : the Prize of FIFTEEN SOVEREIGNS, for his 16 months-old New Oxfordshire Long-woolled Ram ; bred by himself.

EDWARD HANDY, of Sevenhampton : the Prize of THIRTY SOVEREIGNS, for his 40-months old Improved Cotswold Ram ; bred by himself.

EDWARD SMITH, of Charlbury, near Enstone, Oxfordshire : the Prize of FIFTEEN SOVEREIGNS, for his 64 months-old Long-woolled Oxfordshire Ram ; bred by himself.

CHARLES LARGE, of Broadwell : the Prize of TEN SOVEREIGNS, for his pen of 16 months-old New Oxfordshire Long-woolled Ewes ; bred by himself.

EDWARD SMITH, of Charlbury : the Prize of FIVE SOVEREIGNS, for his pen of 16 months-old Long-woolled Oxfordshire Ewes ; bred by himself.

SHEEP : IV. *Mountain Breed.*

JOHN ROBSON, of East Kielder, near Hexham, Northumberland : the Prize of FIFTEEN SOVEREIGNS, for his 39 months-old Cheviot Ram ; bred by himself.

JOHN ROBSON, of East Kielder : the Prize of TEN SOVEREIGNS, for his 51 months-old Cheviot Ram ; bred by himself.

JOHN ROBSON, of East Kielder : the Prize of FIVE SOVEREIGNS, for his 27 months-old Cheviot Ram ; bred by himself.

LORD BAGOT, of Poole Park, near Ruthin, Denbighshire : the Prize of TEN SOVEREIGNS, for his pen of 14 months-old Cheviot Shearling Ewes ; bred by himself.

PIGS.

MOSES CARTWRIGHT, of Stanton House, near Burton-upon-Trent : the Prize of TEN SOVEREIGNS, for his 1 year and 6 months-old Boar of a large breed ; bred by himself.

CHARLES RANDELL, of Chadbury, near Evesham, Worcestershire: the Prize of FIVE SOVEREIGNS, for his 2 years 3 months and 21 days-old Boar of the Essex-enlarged breed; bred by himself.

VISCOUNT HILL, of Hawkstone, near Shrewsbury: the Prize of TEN SOVEREIGNS, for his 1 year and 22 days-old Boar of a small breed; bred by himself.

EDWARD URWICK, of Felton, near Ludlow, Shropshire: the Prize of FIVE SOVEREIGNS, for his 1 year and 11 months-old Boar of the small Essex breed; bred by Henry Quihampton, of Little Totham, near Maddon.

VISCOUNT HILL, of Hawkstone: the Prize of TEN SOVEREIGNS, for his 3 years and 1 month-old Leicestershire Sow of a large breed; bred by W. Houghton, of Parbold, Lancashire.

WILLIAM FISHER HOBBS, of Marks Hall, near Kelvedon, Essex: the Prize of TEN SOVEREIGNS, for his 7 months-old Improved-Essex Sow of a small breed; bred by himself.

WILLIAM FISHER HOBBS, of Marks Hall: the Prize of TEN SOVEREIGNS, for his pen of 33 weeks and 5 days-old Improved-Essex Breeding-Sow-Pigs, of a small breed; bred by himself.

EXTRA STOCK.

JACOB BROWN, of Shrewsbury: an Award of THREE SOVEREIGNS, for 11 months-old Hereford Calf; bred by Edward Humphreys, of Walcot, near Chisbury, Shropshire.

WILLIAM TAYLOR, of The Dyffryd, near Llanymynach, Shropshire: an Award of FIVE SOVEREIGNS, for his 4 years and 4 days-old Hereford Heifer; bred by Richard Hill, of Golding Hall, Shropshire.

CHARLES LARGE, of Broadwell, near Lechlade, Gloucestershire: an Award of FIVE SOVEREIGNS, for his 4 years and 4 months-old New-Oxfordshire Long-woolled Ewe; bred by himself.

JOHN GREGORY WATKINS, of Woodfield, near Worcester: an Award of TWO SOVEREIGNS, for his 5 years and 4 months-old Leicester Ewe, with her Lamb; bred by himself.

THOMAS TURNOR, of Pool Park, near Ruthin, Denbighshire: an Award of FIVE SOVEREIGNS, for his 4 years-old Welsh Mountain Stallion Pony; bred by Peter Wynne, of Llandrillo, Merionethshire.

Commendations.

*ALEXANDER BANNERMAN, of South Cottage, near Chorley, Lancaster: for his 5 years and 13 days-old Short-horned Cow; bred by John Booth, of Killerby, Yorkshire.

VISCOUNT HILL, of Hawkstone: for his 7 years-old Short-horned Cow; bred in Ireland, by T. Holmes.

*VISCOUNT HILL, of Hawkstone: for his 2 years 5 months and 22 days-old Short-horned In-calf Heifer; bred by R. M. Jaques, of Easby Abbey, near Richmond, Yorkshire.

*EDWARD WILLIAM SMYTHE OWEN, of Condoover Hall, near Shrewsbury: for his 1 year and 7 months-old Short-horned Heifer; bred by himself.

*WILLIAM EYTON, Gonsall, near Shrewsbury: for his 4 years and 6 months-old Hereford Bull; bred by the late John Morris, of Stockton, near Leominster.

*THOMAS CAMPBELL EYTON, of Donnerville, and GEORGE T. FORESTER, of High Ercal, Shropshire: for their 1 year and 7 months-old Hereford Bull; bred by the late Thomas Jeffries, of the Grove, near Pembridge, Herefordshire.

*THOMAS LOCKLEY MEIRE, of Cound Arbour, near Shrewsbury: for his 5 years and 6 months-old In-calf Hereford Cow; bred by himself.

*SIR FRANCIS LAWLEY, Bart., of Middleton Hall, Warwickshire: for his 2 years and 7 months-old In-calf Hereford Heifer; bred by himself.

THOMAS LOCKLEY MEIRE, of Cound Arbour: for his 2 years and 5 months-old In-calf Hereford Heifer; bred by himself.

*JAMES CORBETT, of The Sheriffs, near Kington, Herefordshire: for his 1 year 10 months and 25 days-old True-Hereford Heifer; bred by himself.

SIR FRANCIS LAWLEY, Bart., of Middleton Hall: for his 1 year and 11 months-old Hereford Heifer; bred by himself.

*THOMAS LOCKLEY MEIRE, of Cound Arbour: for his 9 months-old Hereford Bull-Calf; bred by himself.

JOHN NELSON CARPENTER, of Eardisland, near Leominster, Herefordshire: for his 6 months and 23 days-old Hereford Bull-Calf; bred by himself.

THOMAS LOCKLEY MEIRE, of Cound Arbour: for his 8 months-old Hereford Bull-Calf; bred by himself.

*HENRY ALLEN, jun., of Oakfield House, near Hay, Brecknockshire: for his 6 years-old Cart Stallion, for agricultural purposes; bred by Colonel Wood, M.P., of Littleton, Middlesex.

*THOMAS CARPENTER, of Hull Farm, near Chipping Norton: for his 3 years 4 months and 2 weeks-old Oxfordshire Ram; bred by himself.

THOMAS CARPENTER, of Hull Farm, near Chipping Norton: for his 3 years 4 months and 2 weeks-old Oxfordshire Ram; bred by himself.

*WILLIAM FISHER HOBBS, of Marks Hall, near Kelvedon, Essex: for his 8 months and 9 days-old Improved Essex Boar (of a small breed); bred by himself.

WILLIAM FISHER HOBBS, of Marks Hall: for his 8 months and 9 days-old Improved Essex Boar (of a small breed); bred by himself.

VISCOUNT HILL, of Hawkstone: for his 2 years and 7 months-old Improved Lancashire Sow (of a large breed); bred by John Jebson, of Manchester.

- *The Rev. JOHN HILL, of The Citadel, near Shrewsbury : for his 46 weeks and 4 days-old cross-bred Essex and Neapolitan Sow (of a small breed); bred by himself.
- *The Rev. JOHN HILL, of The Citadel, near Shrewsbury : for his 46 weeks and 4 days-old cross-bred Essex and Neapolitan Sow (of a small breed); bred by himself.
- The Rev. JOHN HILL, of The Citadel : for his 46 weeks and 4 days-old cross-bred Essex and Neapolitan Sow (of a small breed); bred by himself.
- The Rev. JOHN HILL, of the Citadel : for his 3 years 3 months and 17 days-old cross-bred Essex and Neapolitan Sow (of a small breed); bred by himself.
- WILLIAM FISHER HOBBS, of Marks Hall : for his 20 months-old Improved-Essex Sow (of a small breed); bred by himself.
- WILLIAM FISHER HOBBS, of Marks Hall : for his 7 months-old Improved-Essex Sow (of a small breed); bred by himself.
- *PHILIP PUSEY, M.P., of Pusey, near Faringdon, Berkshire : for his pen of 9½ months-old Berkshire Breeding-Sow-Pigs (of a large breed); bred by himself.

[These Commendations are arranged in the order of the numbers of the Certificates to which they refer. The mark (*) signifies "HIGHLY COMMENDED;" the omission of it, "COMMENDED;" by the Judges.

CHEESE.

The Rev. JOHN JUSTICE, Rector of Tythfield, near Whitchurch, Shropshire : the Prize of TEN POUNDS, for his hundredweight of Cheshire Cheese, as the best Sample of Cheese made within the District of the Meeting.

JOHN SUTTON WILKINSON, of Madeley, near Newcastle, Staffordshire : the Prize of FIVE POUNDS, for his hundredweight of Cheshire-Thick Cheese, as the second-best Sample of Cheese made within the District of the Meeting.

IMPLEMENTS.

[The Award of Prizes in the Implement Department will be found in the Report of the Consulting Engineer of the Society, printed in the body of the present part of the Journal : page 305.]

Annual Country Meeting of 1846,

TO BE HELD AT

NEWCASTLE-ON-TYNE,

IN THE NORTHERN DISTRICT, COMPRISING THE COUNTIES OF NORTHUMBERLAND,
CUMBERLAND, DURHAM, AND WESTMORELAND (INCLUDING
BERWICK-ON-TWEED).

THE PRIZES ARE OPEN TO GENERAL COMPETITION.

FORMS OF CERTIFICATE TO BE PROCURED ON APPLICATION TO THE SECRETARY, 12,
HANOVER SQUARE, LONDON.

ALL CERTIFICATES FOR IMPLEMENTS MUST BE RETURNED, FILLED UP, TO THE SECRETARY
ON OR BEFORE THE 1ST OF MAY, AND ALL OTHER CERTIFICATES BY THE 1ST OF
JUNE; THE COUNCIL HAVING DECIDED THAT IN NO CASE WHATEVER SHALL ANY
CERTIFICATE BE RECEIVED AFTER THOSE DATES RESPECTIVELY.

Prizes for Improving the Breed of Cattle.—1846.

SHORT-HORNS.

CLASS

1. To the owner of the best Bull calved previously
to the 1st of January, 1844 Forty Sovereigns.
To the owner of the second-best ditto ditto Fifteen Sovereigns.
2. To the owner of the best Bull calved since the
1st of January, 1844, and more than one
year old Twenty Sovereigns.
3. To the owner of the best Cow in milk or in calf Fifteen Sovereigns.
[In the case of the cow being in calf, and not in milk, the prize
will not be given until she is certified to have produced a
calf.]
4. To the owner of the best In-calf Heifer, not ex-
ceeding three years old Fifteen Sovereigns.
5. To the owner of the best Yearling Heifer Ten Sovereigns.
6. To the owner of the best Bull-calf, not exceed-
ing one year old Ten Sovereigns.

HEREFORDS.

1. To the owner of the best Bull calved previously
to the 1st of January, 1844 Forty Sovereigns.
To the owner of the second-best ditto ditto Fifteen Sovereigns.

CLASS

2. To the owner of the best Bull calved since the 1st of January, 1844, and more than one year old Twenty Sovereigns.
3. To the owner of the best Cow in milk or in calf Fifteen Sovereigns.
[In the case of the cow being in calf, and not in milk, the prize will not be given until she is certified to have produced a calf.]
4. To the owner of the best In-calf Heifer, not exceeding three years old Fifteen Sovereigns.
5. To the owner of the best Yearling Heifer Ten Sovereigns.
6. To the owner of the best Bull-calf, not exceeding one year old Ten Sovereigns.

DEVONS.

1. To the owner of the best Bull calved previously to the 1st of January, 1844 Forty Sovereigns.
To the owner of the second-best ditto ditto Fifteen Sovereigns.
2. To the owner of the best Bull calved since the 1st of January, 1844, and more than one year old Twenty Sovereigns.
3. To the owner of the best Cow in milk or in calf Fifteen Sovereigns.
[In the case of the cow being in calf, and not in milk, the prize will not be given until she is certified to have produced a calf.]
4. To the owner of the best In-calf Heifer, not exceeding three years old Fifteen Sovereigns.
5. To the owner of the best Yearling Heifer Ten Sovereigns.
6. To the owner of the best Bull-calf, not exceeding one year old Ten Sovereigns.

CATTLE OF ANY BREED:

Not qualified to compete in the foregoing Classes.

(Cross-bred Animals will be excluded.)

1. To the owner of the best Bull calved previously to the 1st of January, 1844 Twenty-five Sovs.
To the owner of the second-best ditto ditto Ten Sovereigns.
2. To the owner of the best Bull calved since the 1st of January, 1844, and more than one year old Fifteen Sovereigns.
3. To the owner of the best Cow in milk or in calf Fifteen Sovereigns.
[In the case of the cow being in calf, and not in milk, the prize will not be given until she is certified to have produced a calf.]
4. To the owner of the best In-calf Heifer, not exceeding three years old Ten Sovereigns.
5. To the owner of the best Yearling Heifer Ten Sovereigns.

HORSES.**CLASS**

1. To the owner of the best Stallion for Agricultural purposes, of any age Forty Sovereigns.
 To the owner of the second-best ditto ditto Fifteen Sovereigns.
 2. To the owner of the best three-years-old ditto Fifteen Sovereigns.
 3. To the owner of the best two-years-old ditto Fifteen Sovereigns.
 4. To the owner of the best Mare and Foal for Agricultural purposes Twenty Sovereigns.
 To the owner of the second-best ditto Ten Sovereigns.
 5. To the owner of the best two-years-old Filly Ten Sovereigns.
 6. To the owner of the best THOROUGH-BRED STALLION, which shall have served Mares at a price not exceeding three guineas (and with a groom's fee of not more than five shillings), in the season of 1846 Thirty Sovereigns.
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S H E E P.*Prizes for Improving the Breed of Sheep.—1846.***LEICESTERS.**

1. To the owner of the best Shearling Ram Forty Sovereigns.
 To the owner of the second-best ditto Fifteen Sovereigns.
2. To the owner of the best Ram of any other age Thirty Sovereigns.
 To the owner of the second-best ditto Fifteen Sovereigns.
3. To the owner of the best pen of Five Shearling Ewes Ten Sovereigns.
 To the owner of the second-best ditto ditto Five Sovereigns.

SOUTH-DOWN SHEEP.

1. To the owner of the best Shearling Ram Forty Sovereigns.
 To the owner of the second-best ditto Fifteen Sovereigns.
2. To the owner of the best Ram of any other age Thirty Sovereigns.
 To the owner of the second-best ditto Fifteen Sovereigns.
3. To the owner of the best pen of Five Shearling Ewes Ten Sovereigns.
 To the owner of the second-best ditto ditto Five Sovereigns.

LONG-WOOLLED SHEEP:*Not qualified to compete as Leicesters.*

1. To the owner of the best Shearling Ram Forty Sovereigns.
 To the owner of the second-best ditto Fifteen Sovereigns.
2. To the owner of the best Ram of any other age Thirty Sovereigns.
 To the owner of the second-best ditto Fifteen Sovereigns.
3. To the owner of the best pen of Five Shearling Ewes Ten Sovereigns.
 To the owner of the second-best ditto ditto Five Sovereigns.

SHEEP BEST ADAPTED TO A MOUNTAIN DISTRICT.

Not qualified to compete as South-Downs.

CLASS

1. To the owner of the best Ram of any age . . . Twenty Sovereigns.
 To the owner of the second-best ditto . . . Ten Sovereigns.
 To the owner of the best pen of Five Shearling
 Ewes Ten Sovereigns.
2. To the owner of the best pen of Ewes of any age . . . Ten Sovereigns.

PIGS.

1. To the owner of the best Boar of a large breed . . . Fifteen Sovereigns.
 To the owner of the second-best ditto ditto . . . Five Sovereigns.
2. To the owner of the best Boar of a small breed . . . Fifteen Sovereigns.
 To the owner of the second-best ditto ditto . . . Five Sovereigns.
3. To the owner of the best breeding Sow of a large
 breed Ten Sovereigns.
4. To the owner of the best breeding Sow of a small
 breed Ten Sovereigns.
5. To the owner of the best pen of three breeding
 Sow-Pigs of the same litter, above four and
 under ten months old Ten Sovereigns.

EXTRA STOCK.

For Extra Stock of any kind, not qualified to compete in any of the above classes, Prizes may be apportioned and awarded, by the Yard Committee and Judges, to an amount not exceeding in the whole Thirty Sovereigns.

WOOL.

- To the owner of the best sample of ten fleeces of
 Long Wool Ten Sovereigns.
- To the owner of the best sample of ten fleeces of
 Short Wool Ten Sovereigns.
- To the owner of the best sample of ten fleeces of
 Wool of mixed breed Ten Sovereigns.

AGRICULTURAL IMPLEMENTS.

A sum not exceeding Three Hundred Sovereigns.—(See p. xli.)

ANY NEW IMPLEMENT.

For the Invention of any new Agricultural Implement, such sum the Council may think proper to award.

RULES OF EXHIBITION.

Certificates.

1. The necessary printed forms of Certificates may be obtained from the Secretary, at No. 12, Hanover-square, London, by persons desirous of exhibiting Stock, &c.

2. No stock will be admitted for exhibition unless the necessary certificates, filled in, upon the printed forms prescribed, complete, and signed by the exhibitor (or his agent), in the manner directed, have been delivered to the Secretary, or sent (postage free), directed to him, so as to reach No. 12, Hanover Square, London, on or before the 1st of June. The Secretary will take an early opportunity of acknowledging the due receipt of such certificates.

3. The name and residence (when known) of the breeder of each animal intended for exhibition, should be stated.

4. The age of each animal must be stated in the certificate. In all cases the age of the animal is to be computed from the day of its birth, excepting in the case of Horses, when the year only will be required.

5. The same animal cannot be entered in two classes.

6. Any person who intends to offer for sale at the auction any of the stock which he may exhibit in the yard, must signify his intention in the certificate.

Arrival of Stock.

1. No stock will be admitted into the yard for exhibition, unless the necessary certificate has been sent to the Secretary at the proper time.

2. All stock entered for exhibition must be brought to the show-yard between the hours of EIGHT in the morning and FOUR in the afternoon of Tuesday, in the week of the show.

3. The parchment ticket, which will be sent by the Director, must be firmly tied on each animal before it is brought to the gate.

4. The "Admission Order," which will also be sent by the Director for stock properly entered, must be delivered to the gate-keeper of the yard by the person who brings the stock for admission.

Auction.

1. There will be a sale by auction of Stock, &c., which have been properly entered in the certificates and exhibited in the yard; this will take place in the show-yard on the morning of Friday, in the week of the show.

2. If an exhibitor should withdraw any stock that has been entered for sale by auction, he must pay a fine of 5s.

3. No stock will be sold by auction unless the owner or his agent is present.

4. An order for the delivery of stock sold at the auction must be obtained from the auctioneer, and delivered at the gate by the person removing the animals.

5. The Society will pay the auctioneer for his attendance on the occasion.
6. The regulations and conditions of the sale will be made public.

Auctioneer.

1. The auctioneer or his clerk will be in attendance in an office in the show-yard from ten o'clock A.M. until four o'clock P.M. on the Thursday of the show-week, for the purpose of receiving instructions from such exhibitors as may have properly entered stock for sale at the auction.

2. The auctioneer will receive all the forfeit-money for the withdrawal of stock from the auction, and give the exhibitor the necessary countersigned order for the removal of such stock from the yard.

3. The auctioneer will take charge of and sell the catalogues of the sale, and he shall deliver over to the Director, for the Society's use, the money arising from the forfeits and the sale catalogues.

Departure of Stock after the Show.

1. All stock must remain in the show-yard until after six o'clock in the afternoon of Thursday in the week of the show, and as much longer as the Director may consider it necessary.

2. No animal can be removed from its place or taken out of the show-yard without leave in writing from the Director or Stewards.

3. If any animal shall not have been removed on the evening of Thursday, it will not be permitted to leave the yard until ten o'clock on Friday morning, in the week of the show.

4. The "Delivery Order," filled up and signed by the exhibitor or his agent, must be delivered to the gate-keeper: no stock can be removed without it, excepting animals sold at the auction, in which case the auctioneer's order will be required.

5. Stallions may be removed for the night, upon permission obtained from the Director or Stewards.

General Rules.

1. Non-members will be required to pay five shillings for every entry of live stock for exhibition before obtaining orders for the admission of their animals into the Show-yard. This payment must be remitted by a post-office order, made payable to the Secretary, and enclosed with the certificate: a neglect in making such remittance may invalidate their entry.

2. No animal which has won a first prize in any class at a previous meeting of the Society will be allowed to compete for a similar prize at the meeting at Newcastle-upon-Tyne.

3. Any person who shall have been proved, to the satisfaction of the Council, to have been excluded from showing for prizes at the exhibition of any society in consequence of having been convicted of an attempt to obtain a prize by giving a false certificate, shall not be allowed to compete for any of the prizes offered by the Royal Agricultural Society of England.

4. In case any gentleman, or number of gentlemen, should wish to offer a prize for any class of stock not distinctly specified among the prizes offered by the Society, he or they will be allowed to offer such prize

at the meeting at Newcastle-upon-Tyne. The stock which may compete for that prize shall be exhibited, subject to the conditions that shall be decided upon by the Council; and the prize awarded by such of the Judges as the Council shall select. Animals exhibited for that prize shall not be prevented from competing for any of the prizes offered by the Society for which they are qualified.

5. No prize will be given when the Judges are of opinion that there is not sufficient merit in the stock to justify an award.

6. No castrated or spayed animal will be allowed to be exhibited in the yard.

Extra Stock.

1. All animals intended to be exhibited as Extra Stock must be duly entered on the printed forms, as in the cases of animals to be shown in the classes.

2. Persons intending to exhibit animals as Extra Stock can alter the blank Certificates to answer their purpose.

3. No animal qualified to be shown in any Class can be exhibited as Extra Stock.

Instructions to the Stewards, &c.

1. The Director and Stewards are instructed to take care that no Governor nor Member (including the Council), stranger, or competitor be admitted into the yard under any pretence whatever, until the awards of the Judges shall have been delivered to the Director.

2. The Council delegates full power to the Director and Stewards to enforce the above regulations.

Instructions to the Judges.

1. The Judges of Stock will be requested to observe that they have up to five o'clock on Wednesday, in the week of the show, for making their adjudication, and signing their award.

2. As the object of the Society in giving the prizes for neat cattle, sheep, and pigs, is to promote improvement in *breeding* stock, the Judges, in making their award, will be instructed not to take into their consideration the present value to the butcher of animals exhibited, but to decide according to the relative merits for the purpose of *breeding*.

3. If, in the opinion of the Judges, there should be equality of merit, they are instructed to make a special report to the Council, who will decide on the award.

4. The Judges will be instructed to withhold any prize if they are of opinion that there is not sufficient merit in any of the stock exhibited for such prizes, to justify an award.

5. In the class for horses, the Judges, in awarding the prizes, will be instructed, in addition to symmetry, to take activity and strength into their consideration.

6. The Judges will be instructed to deliver to the Director their award, signed, and stating the numbers to which the prizes, &c. are adjudged, before they leave the yard.

PRIZES FOR IMPLEMENTS.

1846.

Forms of Certificate to be procured on application to the Secretary, 12, Hanover Square, London. All Certificates must be returned filled up, to the Secretary, on or before the First of May; the Council having decided, that in no case whatever shall any Certificate for Implements be received after that date.

Prizes.

- For the Plough best adapted to heavy land . . . Ten Sovereigns.
 For the Plough best adapted to light land . . . Ten Sovereigns.
 For the best Drill for general purposes, which shall possess the most approved method of Distributing Compost or other manures in a moist or dry state, quantity being especially considered . . . Fifteen Sovereigns.
 [Other qualities being equal, the preference will be given to the Drill which may be best adapted to cover the manure with soil before the seed is deposited.]
 For the best Turnip Drill on the flat, which shall possess the most approved method of Distributing Compost or other manures in a moist or dry state, quantity being especially considered . . . Ten Sovereigns.
 [Other qualities being equal, the preference will be given to the Drill which may be best adapted to cover the manure with soil before the seed is deposited.]
 For the best Turnip Drill on the ridge, which shall possess the most approved method of Distributing Compost or other manures in a moist or dry state, quantity being especially considered . . . Ten Sovereigns.
 [Other qualities being equal, the preference will be given to the Drill which may be best adapted to cover the manure with soil before the seed is deposited.]
 For the best Scarifier . . . Ten Sovereigns.
 For the best Chaff-cutter . . . Ten Sovereigns.
 For the best Machine for making Draining Tiles or Pipes for agricultural purposes. Specimens of the Tiles or Pipes to be shown in the Yard: the price at which they have been sold to be taken into consideration, and proof of the working of the Machine to be given to the satisfaction of the Judges . . . Twenty Sovereigns.

For the best Harrow	Five Sovereigns.
For the best Drill Presser depositing Manure and Seed	Ten Sovereigns.
For the best Churn	Five Sovereigns.
For the best Weighing Machine, for live Cattle and Farm Produce generally	Ten Sovereigns.
For the best Steaming Apparatus for Roots	Five Sovereigns.
For the best Skim or Paring Plough	Five Sovereigns.
For the best Subsoil Pulverizer	Ten Sovereigns.
For the best Horse-Seed-Dibbler	Fifteen Sovereigns.
For the best Hand-Seed-Dibbler	Five Sovereigns.
For the best Linseed-Crusher	Five Sovereigns.
For the best One-Horse Cart	Five Sovereigns.
For the best Thrashing Machine	Twenty-five Sovs.
For the best and most economical Set of Tools and Instruments for Draining purposes	Ten Sovereigns.
For the best Steam Power, applicable to Thrashing or other Agricultural purposes	Twenty-five Sovs.
For the best Horse Power, ditto, ditto	Twenty-five Sovs.
Miscellaneous Awards, amounting to	Forty Sovereigns.

GENERAL REGULATIONS FOR THE EXHIBITION OF IMPLEMENTS.

Certificates.

1. The necessary printed forms of certificates may be obtained from the Secretary, at No. 12, Hanover Square, London, by persons who are desirous of exhibiting implements, &c.

2. No implement will be admitted for exhibition unless the necessary certificates, filled in on the printed form prescribed, complete, and signed by the exhibitor (or his agent), in the manner directed, have been delivered to the Secretary, or sent (postage free), directed to him so as to reach No. 12, Hanover Square, on or before the FIRST OF MAY. The receipt of all certificates will be acknowledged by the Secretary.

3. A description of each article intended to be shown must be written on one side only of the certificate; it must state the name and address (when they are known) of the inventor, the improver, and the manufacturer: it must also detail the improvements (if any), peculiarities, &c., of each implement.

4. The certificate must state the space each exhibitor will probably require (the sheds being 20 feet wide), in order that the Director or Stewards may apportion the standing-room among the various parties who make application.

5. The certificate must state the lowest selling price of each article; and *each Exhibitor shall be bound to execute all orders given to him in the Show Yard, at the price stated in his certificate.*

6. If an article is intended to compete for the prize offered for any new agricultural implement, it must be entered as such in the certificate.

7. If a prize or medal has been awarded at a previous meeting of the Society, to any implement which is entered for exhibition at Newcastle, the certificate must state whether it was a prize or medal, or both, and the date at which it was awarded; if a prize, the amount must be stated.

8. If any improvement has been made in the implement subsequently to that award, a description and drawing of the improvement must accompany the certificate.

9. Exhibitors must state the number of men or boys, and horses, required to try each implement, in case it should be selected for trial by the Judges.

10. Persons who intend to send their own horses and driver to work in the field, must declare, in the certificate, their intention of doing so; otherwise they will not be entitled to the remuneration stipulated in Rule 26.

11. Any person who intends to offer for sale at the Auction, any of the articles which he may exhibit in the Yard, must signify his intention in the certificate.

Arrival of Implements, &c.

12. All implements, &c., entered for exhibition, must be brought to the Show-yard before nine o'clock on the evening of the Thursday previous to the Show.

13. No implement, &c., will be admitted into the Yard for exhibition, unless it has been described as a separate article, in the form prepared for that purpose, attached to the certificate delivered to the Secretary.

14. A ticket, bearing the number corresponding with the certificate, must be attached to some conspicuous part of each article, before it is brought to the gate.

15. The admission-order, which will be sent for articles properly entered, must be delivered to the gate-keeper of the Yard by the person who brings the articles for admission.

16. No implement, having upon it paint or varnish that is wet, will be allowed to enter the Yard.

Arrangement of Implements.

17. All implements must be unpacked and arranged in each stand, by the exhibitor, according to their numbers, and in the same direction as the numbers of the different stands run, consecutively. As no day has been set apart this year for the arrangement of implements, exhibitors are requested to have them arranged by nine o'clock in the evening of Thursday, in the week of the show, as the Judges will commence their inspection early on the following morning. All Implements, &c., that are not unpacked by that hour, will be removed from the Yard.

18. No implement will be allowed to be painted or varnished after it has entered the Yard.

Trial.

19. All implements admitted to the exhibition will be liable, upon the recommendation of the Judges, to be proved by actual trial.

20. Ample private trial will be given to such implements as the

Judges shall select, and at the time and place appointed by the Stewards.

21. A public exhibition of "implements at work" will take place; but of such implements only as may be selected by the Judges, or of such as have gained prizes at previous meetings of the Society.

22. No person will be permitted to remove any implement from the Yard to the Field, unless by the express orders of the Director or Stewards, upon the recommendation of the Judges.

23. Exhibitors are requested to be in attendance during the trials, and in the implement-yard, while the Judges are inspecting the implements, in case any explanation may be required from them.

24. No implement will be allowed to commence work in the Field, unless by the express orders of the Judges or Stewards.

25. Notice of the nature of the soil, upon which the trials are to take place, will be given to the exhibitors by the Secretary.

26. An option of sending a pair of horses and a man is given to the exhibitors of implements, if they declare such intention at the time of returning the certificate; the Society paying to the man 5s. for each day he works at the trial of implements, and 2l. for the pair of horses for the three days, to be employed primarily at the exhibition of the master's implements; but should these not be in work, to be under the directions of the Stewards.

27. Chaff-cutters, corn-crushers, and other small implements, will be removed, for trial, into the space attached to the implement-yard, into which space the Judges of implements, and the exhibitor, during the trial of his implement, will alone be admitted.

28. Hay, straw, turnips, &c., may be brought with the implements for the purpose of being used in the trial of those implements.

Consulting Engineer.

29. The Consulting Engineer will not act as one of the Judges of implements, but only act as mechanical referee, in case the Judges may deem it necessary to call in his aid.

30. The Consulting Engineer will be in attendance in the Yard, and during the trials, to examine the implements.

Auction.

31. There will be a sale by auction of Stock, Implements, &c., which have been properly entered in the certificates and exhibited in the Yard.

32. If an exhibitor should withdraw any article or lot of articles that has been entered for sale by auction, he must pay a fine of 5s.

33. No article will be sold by auction unless the owner or his agent is present.

34. An order for the delivery of articles sold at the auction must be obtained from the auctioneer, and delivered at the gate by the person removing them.

Auctioneer.

35. The auctioneer or his clerk will be in attendance in an office in the show-yard from ten o'clock A.M. until four o'clock P.M. on the Thursday

of the show-week, for the purpose of receiving instructions from such exhibitors as may have properly entered implements for sale at the auction.

36. The auctioneer will receive all the forfeit-money for the withdrawal of implements from the auction, and give the exhibitor the necessary countersigned order for the removal of such implements from the Yard.

37. The auctioneer will take charge of and sell the catalogues of the sale, and he shall deliver over to the Director, for the Society's use, the money arising from the forfeits and the sale catalogues.

Departure of Implements, &c. (After the Show.)

38. No implements, excepting those selected for trial, can be removed from the Yard, until 6 o'clock on the evening of Thursday, in the week of the show.

39. The "Delivery Order," filled up and signed by the exhibitor or his agent, must be delivered to the gate-keeper: no implement can be removed without it, excepting those entered for the auction, in which case the auctioneer's order will be required.

General and Miscellaneous Regulations.

40. Non-Subscribers wishing to exhibit implements, &c., are required to pay 5s. for their standing-room during the show. This payment must be sent by a Post-Office Order made payable to the Secretary, and enclosed with the certificate: a neglect in making such remittance may invalidate their entry.

41. Implements which have been removed to the field must be brought back to the Yard, and replaced according to their numbers, either on the Tuesday evening or Wednesday morning, by 6 o'clock.

42. No fire will be allowed to be lighted in the Show-yard for any steam-engine or other implement.

43. After the Consulting Engineer's Report on the implements has appeared in the Journal, a copy of that Report will be delivered gratis to such exhibitors of implements as may not be members of the Society, upon their making application to the Secretary, at No. 12, Hanover Square.

44. On Tuesday and Wednesday the price of admission into the Implement Yard will be 2s. 6d.

45. Exhibitors of Implements will have a Free Ticket sent to them with the "Admission Order."

46. The Judges' decision in all cases to be final.

47. Any person who shall have been proved, to the satisfaction of the Council, to have been excluded from showing for prizes at the exhibition of any society, in consequence of having been convicted of an attempt to obtain a prize by giving a false certificate, shall not be allowed to compete for any of the prizes offered by the Royal Agricultural Society of England.

Instructions to the Judges.

The Judges will have the Friday, Saturday, and Monday previously to the show for making their adjudication and signing their award.

The Judges will be instructed neither to divide nor to increase any of the specific prizes. If they should not award any specific prize mentioned in the Prize Sheet, they will be instructed not to appropriate that sum to any other description of implement.

If, in the opinion of the Judges, there should be equality of merit, they will be instructed to make a special report to the Council, who will decide on the award.

The Judges will be instructed to withhold any prize, if they shall be of opinion that there is not sufficient merit in any of the implements exhibited for such prizes to justify an award.

The Judges will be requested to observe that, in addition to the specific prizes, there is a sum of 40*l.*, which they have the power of distributing in awards (either in money or medals) among the exhibitors of such miscellaneous articles as they may decide to possess sufficient merit.

The Judges will be instructed to deliver to the Director their *final* and *complete* award of all prizes and medals *before they leave the Yard*, on the evening of Monday, in the week of the show, in order that the necessary placards may be placed on the Prize Implements.

The Judges will be requested to observe that it is left to their discretion to select the implements for trial, and also to determine which shall be publicly exhibited at work in the field.

In making their decision, the Judges will be instructed to take the selling prices of the implements into consideration.

The Consulting-Engineer of the Society will be in attendance in the Implement Yard, and also during the private trials, to give his opinion as Mechanical-Referee when required by the Judges.

Instructions to the Stewards.

The Director and Stewards of the Implement Yard are instructed to take care that no Governor, Member (including the Council), or Stranger, be admitted into the Implement Yard before Tuesday, in the week of the show. They are also instructed not to admit into the Trial Yard, adjoining the Yard, any person excepting the Judges and the exhibitors during the trial of their respective implements.

The Stewards are empowered to make such regulations for the trial of implements as they may consider requisite; and previously to the time of the meeting to place the land which they may select under such culture and management as may ensure a fair and perfect trial.

The Council also delegates full power to the Director and Stewards to enforce the above regulations.

* * All Exhibitors and persons admitted into the Show-yard, shall be subject to the Rules, Orders, and Regulations of the Council.

PRIZES FOR ESSAYS AND REPORTS ON VARIOUS SUBJECTS.

1846.

All Prizes of the Royal Agricultural Society of England are open to general competition.

I. FARMING OF NORTH WALES.

FIFTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Report on the Farming of North Wales.

Competitors will be expected to describe the different varieties of soil which prevail in North Wales, and the quality and extent of the waste lands; also the ordinary modes of farming and courses of cropping adopted according to its various districts; and to state how far any peculiar practices in its husbandry are or are not justified by peculiarities of soil or climate. They will also be expected to state what improvements have been made in the farming of North Wales since the Report of the Rev. Walter Davies in the year 1810; and especially to point out what further improvements ought to be effected, either by better farming on land already cultivated, or by converting land now waste into arable, pasture, or catch-meadow.

N.B. The writers of County Reports are requested, if possible, not to exceed the length of 40 or at most 50 printed pages.

II. FARMING OF WEST RIDING OF YORKSHIRE.

FIFTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Report on the Farming of the West Riding of Yorkshire.

Competitors will be expected to describe the different varieties of soil which prevail in the West Riding of Yorkshire, and the quality and extent of the waste lands; also the ordinary modes of farming and courses of cropping adopted according to its various districts; and to state how far any peculiar practices in its husbandry are or are not justified by peculiarities of soil or climate. They will also be expected to state what improvements have been made in the farming of the West Riding of Yorkshire since the Report of Robert Brown in the year

1799; and especially to point out what further improvements ought to be effected.

III. FARMING OF CAMBRIDGESHIRE.

FIFTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Report on the Farming of the County of Cambridge.

Competitors will be expected to describe the different varieties of soil which prevail in the county, the ordinary modes of farming and courses of cropping adopted accordingly in its various districts; to describe the great works of drainage; and to state how far any peculiar practices in its husbandry are or are not justified by peculiarities of soil or climate. They will also be expected to state what improvements have been made in the farming of Cambridgeshire since the Report of the Rev. W. Gooch in the year 1813; and especially to point out what further improvements ought to be effected, either by better farming on land already cultivated, by improvement of the general drainage, or by taking new land into cultivation.

IV. ON THE ADVANTAGES OR DISADVANTAGES OF BREAKING UP GRASS-LAND.

FIFTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Report on the Advantages or Disadvantages of Breaking up Grass-land.

Competitors will be expected to state the advantages so arising to the labourer, the farmer, the landlord, and the public, from increase of employment, of profit, of rent, and of food.

Grass-lands must be divided under at least three heads—of down-lands, cold pastures, and good meadow or grazing ground.

The mode proposed for breaking up and tilling each kind of grass-land must be described.

V. ON THE IMPROVEMENT OF THE CONDITION OF THE AGRICULTURAL LABOURER.

THIRTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Essay on the Improvement of the Condition of the Agricultural Labourer, so far as it may be promoted by private exertion, without legislative enactment.

VI. ON THE BEST METHOD OF KEEPING FARMING ACCOUNTS.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Essay on the Keeping of Farming Accounts.

VII. ON MEASURE-WORK.

TWENTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best account of Measure-Work, locally known as Task, Piece, Job, or Grate Work, in its application to Agricultural Labour; detailing the various descriptions of such work to which any system of measure is applicable; the rates usually paid, and the sum usually earned in a given time; and comparing the effects of such payment with those arising from the payment of wages by time, on the direct interest of the employer, and especially on the habits, comforts, and general condition of the employed: the whole deduced, as much as possible, from personal experience; and affording to parties unacquainted with the practice the means of estimating its advantages, and the information necessary for carrying it out.

VIII. PEAT CHARCOAL AS A MANURE FOR TURNIPS OR
OTHER CROPS.

TWENTY SOVEREIGNS, or a Piece of Plate of that value, will be given for the best Essay on Peat Charcoal as a Manure for Turnips and other Crops.

Competitors will be required to attend to the following points:—

1. Quality of peat.
2. Mode of making the heaps and burning the charcoal.
3. Quantity produced from a given measure of peat.
4. Quantity applied per acre, and effect, in comparison with peat-ashes, and with some other manure.

N.B. The Essays for this Prize need not be sent in before the 1st of December, 1846.

IX. THE ST. JOHN'S-DAY RYE.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for the best account of the St. John's-day Rye.

Competitors will be required to attend to the following points:—

1. Times of sowing, and cutting or feeding off in autumn and spring.
2. Comparison of this variety with the common rye.
3. Estimated amount of feed.

N.B. The Essays for this Prize need not be sent in before the 1st of October, 1846.

X. SUPERPHOSPHATE OF LIME.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for the best account of the use of Superphosphate of Lime produced with Acid and Bones for Manure.

Competitors will be required to attend to the following points:—

1. State of Bones.
2. Proportion of sulphuric or muriatic acid to a given weight of bones.
3. Proportion of water (if any) mixed with the acid.

4. Mode of mixing the bones with the acid, and of preparing the compost.
5. Effect of various quantities applied in combination or comparison with common bones and other known manures.

XI. WHITE MUSTARD.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for the best account of the Cultivation of White Mustard.

Competitors will be required to attend to the following points:—

1. Quality of land on which sown.
2. Mode and time of sowing, and quantity of seed.
3. Period of maturity according to the season of the year.
4. Application of crop, whether as green manure or to be fed off.

XII. DRAINAGE OF RUNNING SANDS.

TEN SOVEREIGNS, or a Piece of Plate of that value, will be given for a description of the best method of Draining Running Sands.

XIII. POTATO DISEASE.

FIFTY SOVEREIGNS, or a Piece of Plate of that value, will be given by His Grace the DUKE of NORTHUMBERLAND for the best Essay on the remedy for the Potato Disease, and on its treatment in the various stages of planting, growth, and preservation.

Competitors for this prize will be required to furnish information under the following heads:—

1. An account of the Growth of the Potato during the last year, with reference to the nature of the season.
2. The nature and cause of the disease.
3. The remedies for the disease, explaining the principles on which the remedy is founded.
4. The treatment of the Potato in planting, both from the tubers and from the seed, and in various stages of its growth.
5. The mode of pitting and preserving Potatoes in ordinary seasons, with the principles upon which any improved plans may be founded.

TWENTY SOVEREIGNS, or a Piece of Plate of that value, will be given by His Grace the DUKE of NORTHUMBERLAND for the second best Essay on the same subject.

THIRTY SOVEREIGNS, or a Piece of Plate of that value, will be given by His Grace the DUKE of NORTHUMBERLAND for the best History of the Disease at the present time affecting the Potato; involving a condensed detail of facts developed by experiments.

Competitors for this prize will be required to furnish information on the following points :—

1. The year in which the Disease first appeared in this or other Countries.
2. The History of the Disease in the Potato in the United Kingdom and in other parts of the world, with particular reference to authentic returns regarding any peculiarity of season or seasonal variations.
3. On the methods for retarding the disease.
4. On the methods proposed for extracting the nutritive ingredients of diseased Potatoes.

N.B. The Essays for the Duke of Northumberland's Prizes need not be sent in before the 1st of June, 1846.

These Essays (with the exception of those in Classes VIII., IX., and XIII.) must be sent to the Secretary, at 12, Hanover Square, London, on or before March 1st, 1846.

Contributors of Papers are requested to retain Copies of their Contributions, as the Society cannot be responsible for their return.

RULES OF COMPETITION FOR PRIZE ESSAYS.

1. All information contained in Prize Essays shall be founded on experience or observation, and not on simple reference to books, or other sources.
 2. Drawings, specimens, or models, drawn or constructed to a stated scale, shall accompany writings requiring them.
 3. All competitors shall enclose their names and addresses in a sealed cover, on which only their motto, and the subject of their Essay, and the number of that subject in the Prize list of the Society, shall be written.
 4. The President or Chairman of the Council for the time being, shall open the cover on which the motto designating the Essay to which the Prize has been awarded is written, and shall declare the name of the author.
 5. The Chairman of the Journal Committee shall alone be empowered to open the motto-paper of such Essays, not obtaining the Prize, as he may think likely to be useful for the Society's objects, with a view of consulting the writer confidentially as to his willingness to place such paper at the disposal of the Journal Committee.
 6. The copyright of all Essays gaining prizes shall belong to the Society, who shall accordingly have the power to publish the whole or any part of such Essays; and the other Essays will be returned on the application of the writers; but the Society do not make themselves responsible for their loss.
 7. The Society are not bound to award a prize unless they consider one of the Essays deserving of it.
 8. In all reports of experiments the expenses shall be accurately detailed.
 9. The imperial weights and measures only are those by which calculations are to be made.
 10. No prize shall be given for any Essay which has been already in print.
 11. Prizes may be taken in money or plate, at the option of the successful candidate.
 12. All Essays must be addressed to the Secretary, at the house of the Society.
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I. A. R. I. 75.

IMPERIAL AGRICULTURAL RESEARCH
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